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for radio amateurs

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for radio amateurs

#160 JANUARY 1974

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Our Cover. Sage Green, age 4, really digs two meter FM, even on horseback.

Note that the subscription rates are inching up a tad, and be warned that this is just the beginning. The post office and the paper biz are ganging up on magazine readers.

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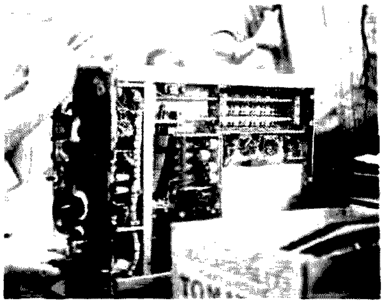
Amateur Radio

JANUARY MCMLXXIV — **Monthly Ham**






AUCTION ACTION

Auctions of ham gear bring out the scroungers, the builders, the cheapskates and the con men. The above pictures were taken recently at a typical New England auction . . . the Honeywell group in Billerica (Mass.) where long rows of tables were piled high with goodies. Where else can you get a Collins transceiver for $2 in good shape?

Just about everything imaginable in test equipment, surplus rigs, old ham gear, home made stuff, and microwave equipment went on the block. The buyers were gloating as they lugged away their prizes and the sellers had the satisfaction of cleaning out stuff that they no longer needed . . . and having some extra money to boot. Was that an IRS agent over in the corner making notes of the sales to check against next year's income tax returns?

The next big New England auction is scheduled for April 12th in Leominster where the Montachusett Amateur Radio Club will host at the Odd Fellows hall. Look for all sorts of things there, from bc radios to televisions, hi-fi, lots of test equipment (we bought a beautiful twin trace scope there at the '73 auction), ham gear, antennas, and etc.

Anyone who has been complaining about amateur radio being an expensive hobby should get to some auctions and change his mind.

Jeff Bishop W7CTX went one better when getting his new call letter license plates!

READERS GIVE US THE BUSINESS!

How about articles on antenna con struction HF and VHF; legal actions, zoning, TVI, as applied to amateur radio; court decisions can set precedents which could be helpful to fellow amateurs . . . WA6HOB. (Excellent idea – any ham lawyers out there want to try an article or perhaps even a column? . . .ed). *More IC projects, 2M receiver using IC, and keep up the good work . . .* WB6QAM/1. *VHF (to 450 MHz) wattmeter; simple deviation meter; counter calibration hints; how about PROSE GOES bumper stickers for sale? . . .* WB6BLV. *I would like to see more in the Circuits, Circuits, Circuits section; a 220 MHz FM rig . . .* W7CWK. *More antenna construction articles. I like to experiment with new types of antennas. You have a great magazine . . .* WA5ZXG. *Keep up the good work . . .* W4RSE. *Keep coming with info and comments on FCC. Complex construction projects should have complete pc board drawings. Keep it up . . .* WN9KZO. *Great article about ham radio in Jordan, more, more . . .* WN1SIX. *Not particularly interested in Wayne's DXpeditions; good magazine . . .* SB5BNM. *How about an article on what each IC in the TTL 7400 does? . . .* SWL Hemmingway. *I'd like to see a detailed project for multi-channeling an HT-200 . . .* WA8ZWJ. (I wouldn't, so if you have one send it to ZWJ direct; gear's too old now . . . ed) *I am behind you in your fight with the FCC. It's high time that our government remembers that it's a government of the people, by the people and for the people, not the other way around. I am interested in simple, portable and cheap projects, particularly antennas, for the hf bands . . .* WN6UAI. *With all the TTL ICs, how about some good info on characteristic and uses of memories, 7000 series and others to adapt the TV typewriter of Sept. Radio Electronics to RTTY and other amateur uses? . . .* WB4DGR. (Okay

News Pages

with us, any authors out there? . . . ed) *If it takes sexy pictures to sell a radio magazine there must be something wrong with the radio magazine . . .* WØLFH. (No. not with the magazine, with the buyers . . . ed). *What about an ATV column? . . .* VE2BAQ. (Maybe . . . any volunteers? . . . ed). *Too much FM; more DXing articles; more IC projects, accessories for the ham station . . .* W6UFJ. *More two meter FM . . .* Hinckley. (Hey, get together with UFJ there . . . ed). *FB magazine; a few good covers, and few great covers . . .* Vaughn *Could use more operating hints for Novices . . .* WN2NUZ. *Too many articles have errors . . .* W1EOF. (Picky, picky . . . ed). *Congrats on your CW IC keyer, it looks like a first to me. Good job, keep it up . . .* W9MXJ. *Fine magazine. More on 2m FM . . .* W9NQM. *Let QST do the operating news. Keep hams pushing their congressmen and senators for repeal of strict 2m FM rules. It's starting to work . . .* K4AVQ/3. (Right! . . . ed). *Less DX news . . .* K3VOM. *Don't really see much value in reporting who worked whom on 50 MHz and other columns. I really enjoyed article on Wayne's visit to Jordan Need articles for people such as me who are trying to build repeaters . . .* WA3SWS. *I enjoy humor articles . . .* K3KAP (So write to Bob Manning and get him at the typewriter . . . ed) *I did not care for the trip to Jordan. More VHF and UHF construction projects such as antennas, converters, mixers, transmitters, amplifiers, using state of the art components . . .* WA6DJR. *Want complex construction such as digital counters, dvm's, quality test equipment. Some theory each month special intro to FM, RX and TX theory and a little math I've noticed that most authors drop the math which seems odd to me. Did you know that over 70% of all Americans under 50 have had at least one year of algebra, so why not speak the language the 70% can understand? . . .* DJØKM. (We suspect that 65% have already forgotten algebra . . . ed). *Your mix of HF, UHF and FM is fine. I enjoy the VHF and UHF articles. Also enjoy W2NSD talk on ham problems . . .* K1YLU.

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Advanced Class	3.525– 3.775	3.800– 4.000
	7.025– 7.150	7.150– 7.300
	14.025–14.200	14.200–14.350
	21.025–21.250	21.270–21.450
	28.000–28.500	28.500–29.700
	50.000–50.100	50.100–54.000
General Class	3.525– 3.775	3.890– 4.000
	7.025– 7.150	7.225– 7.300
	14.025–14.200	14.275–14.350
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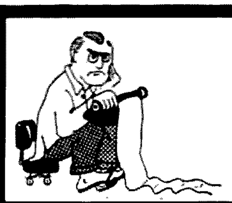
RESTRICTED COUNTRIES (don't work) are now down to only Vietnam(s) 3W8 and XV, with the exception of XV5AC being okay.



NEVER SAY DIE

...de W2NSD/1

EDITORIAL BY WAYNE GREEN

POWER CORRUPTS

As Senator Long of Missouri said, after a subcommittee probe of the IRS, "IRS has become morally corrupted by the enormous power with which we in Congress have unwisely entrusted it. Too often, it acts like a Gestapo preying upon defenseless citizens."

The Senate hearing brought out that the IRS has stolen records, threatened reputable people, illegally tapped phones, criminally picked locks, defied court orders, spied on the mail of tens of thousands of citizens, illegally bugged phones, even booths, hidden microphones to hear taxpayers talk with their lawyers, and used just about every dirty trick in or out of the book to persecute those that it wants to screw.

If the end is accepted as justifying the means, then there might be some argument that, well, this is the only way we can "get" the leaders of organized crime. Unfortunately it is not organized crime that has been the subject of this persecution, but those least able to cope with it, the small businessmen. They are a lot easier to pick on and this means that promotions within the IRS are based upon the broken lives and businesses of these small people. In the IRS you either produce tax money or you get out.

The IRS has the power to confiscate everything you own, merely on the *claim* that you owe taxes. Once they claim, it is up to you to prove that you don't owe the money . . . at your own expense . . . which can be difficult when your bank account has been closed by the IRS. Your salary has been confiscated, and everything you own has been seized.

Secret IRS Laws

The income tax laws that you must obey with accuracy under penalty of heavy fines and imprisonment are not even understood by the commissioner who heads the Internal Revenue Service. These laws are so complex that no person can possibly understand them and no two agents can agree on them. The manuals of regulations and the volumes of official interpretations fill a bookshelf 33 feet long . . . the table of contents alone runs to over one thousand pages!

These books are so secret that the IRS will not permit a taxpayer to look at them . . . it took a court order to force the IRS to let a citizen even look at the table of contents!

Is it possible that the taxpayer is in the position of having to obey the rules in these books (or else!), yet is prohibited by the IRS from seeing the rules? That's the way it works. Not that mastering the enormous IRS bookshelf would do you that much good, for Congress is constantly changing the tax laws and the IRS is constantly writing more and more obscure interpretations of the laws. There are companies that try to keep up with the ever changing regulations and provide the information for tax lawyers, tax accountants and other seriously interested people who make this their life's work. But even these people, with all their investment in time and money trying to keep up with the regulations, are seldom able to agree. Where does that leave the poor average taxpayer?

When the income tax was started in 1913 the IRS took about 1% of the annual income. Now the IRS is the largest single item on the family budget, taking more than the cost of the home, car, food, or even the education of the children in most cases. How did the IRS grow so big and so powerful? It is a beautiful example of bureaucracy out of control. Its secrecy and arrogance have grown with its omnipotence. The IRS is auditing you and your business, but no one is auditing the IRS. It has successfully avoided any serious examinations by Congress or even the General Accounting Office, the federal watchdog agency.

The taxpayer who has the guts to ask the IRS for details on a decision which affects him meets evasions, delays, and closed doors. If he pushes a bit he may find himself the butt of retaliation with year after year of hostile auditing of his returns. There is no question that the rule at IRS is if you make trouble for them they will make trouble for you . . . a whole lot of trouble . . . and it will go on just about forever . . . they never forget. In effect this means that practically speaking your tax is whatever the IRS agent says it is and you'd better pay up or else.

We Get Letters

The editorial in the November issue about the IRS brought in quite a pile of letters from amateurs who have suffered at the hands of these merciless "public servants." We'll print some of them, omitting the names and calls to prevent retaliation.

How It Started

Since the IRS is so secretive it is difficult to say exactly how the "case" against 73 Magazine got started, but despite the wall of secrecy there is no question now that a "squeal letter" triggered the original examination. There is little real doubt about exactly who sent in the squeal letter or why he did it. Unfortunately, though it is obvious, we can't prove it . . . so we can't yet publish the details.

As happens so many times in these IRS cases, the real reason for the attempt to screw 73 Magazine had nothing to do with taxes whatever, but was the result of a 73 publication which suggested some rough ideas on saving tax money. The story came out when an IRS agent who thought the whole thing stunk spilled the beans to a friend of ours . . . and the word got back.

Along in 1965, as I recall, I wrote a little booklet called "How to Make a Million Dollars." In it I pointed out that if making a lot of money was your goal, this was the easiest way to do it. There was nothing in any way illegal in the booklet, just the benefit of my years of experience. Toward the end of the booklet I mentioned that making the million was only part of the problem – then came the difficulty of trying to hold onto it. I admitted little knowledge of the tax laws, but I did suggest that a tax expert be consulted and that such would be well worth while.

The fact is that the IRS does not want people to consult tax experts. The IRS knows that most people overpay their income tax and they want it to stay that way. They know that the progressive tax goes on up to 94% of income and they prefer that the taxpayer be as ignorant of the tax laws as possible.

This booklet has so irritated the IRS that they decided to fix me but good. The IRS has a record of harassing writers, reporters and publishers who try to inform the public on tax matters or on the abuses of the IRS. They don't even like commercial tax preparing companies for these are generally in the business of trying to save their clients from overpaying their taxes. The IRS is opposed to the

(Continued on page 16)

SSTV SCENE

Dave Ingram K4TWJ
Rte. 11, Box 499, Eastwood Vil. 50N
Birmingham AL 35210

I often receive inquiries on sources of filters for eliminating the bright blue initial trace on P7 Cathode Ray tubes used for Slow Scan, so here's a brief recap. The larger photographic supply outlets usually carry "gelatin" filters which are available in 10 inch sheets for 2 or 3 dollars. Since yellow is the opposite of blue on a color chart, it will filter blue and only very slightly affect the green (persistence). Kodak calls this a Wratten 15 G Filter. Also, Edmund Scientific Company of 300 Edscorp Building, Barrington, New Jersey 08007, has a nice filter in their catalog called "lemon yellow" which sells for about 2 dollars. Another source is advertising display stores and decoration suppliers. In the past, I've used two blank, evenly underexposed color film negatives (which are orange in color) taped together as a filter, and it worked quite well. However yellow would let more of the green persistence through. You could create a filter of any desirable color by adding ordinary cake coloring to a glass of water, then placing this in front of the monitor screen. By diluting the water you can vary the density of the filter. This idea may be handy for those of you working with color SSTV.

Another hard-to-find item is 50 or 70 degree yokes and focus magnet assemblies for those electromagentically deflected monitors. True, these can be a problem, but don't overlook naval surplus outlets, and the older TV repair shops. Often they have a storehouse full of early model TV's, which used these components, and will be glad to donate them to a worthy cause.

By now I'm sure most of you have heard the details about our sad 220 MHz rip-off. Although we as Slow Scan ops may not presently use 220 MHz, there was an aspect of Slow Scan research headed in that direction. This was faster scan rates, which would produce much higher resolution, but would require a greater bandwidth. (Some very interesting thoughts on this are presented on pages 216 and 217 of the 73 Slow Scan TV Handbook.) Since this bandwidth would be too large for low bands, but not wide enough to warrant 440 MHz use, 220 MHz was the obvious band for experimentation. However, one other possibility still exists and that is using a small portion of 10 meters for this "High Resolution Slow Scan". If those interested in such an endeavor would join together as a group and apply to the FCC for temporary permission for experimentation, the results might be surprisingly worth while (and might help preserve 10 meters from future "cuts"). If you become interested in these ideas, let me know and I will get a group list started and put all in touch with each other.

The annual world-wide Slow Scan contest is coming up on the 9th and 17th of February, and if all goes as planned this year will be the biggest yet. This year we are joining with *CQ Elettronica*, and 73 will be awarding certificates to the top scoring U.S. stations, while *CQ Elettronica* will issue awards to the world leaders. *I will be collecting only U.S. station logs for tallying, then forwarding them to Franco, I1LCF, for world tallying.* The 73 awards will be given from logs that I tally, so if you want in on the action, be sure to send your log to me. Remember, I will forward the scores to Franco (probably scores, not logs . . . overseas postage for a bundle like that is stiff).

Those of you who worked either HB9NL or HB9AIC on SSTV last October during their trip to Liechtenstein will be glad to hear they are QSLing 100% (especially those choice SSTV QSOs). Cards go directly to either HB9NL, Acklin Frank,

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November 1973

CH-6233 Bueron, Switzerland *or* HB9AIC, Herger Bruno, Wesemlinterrasse 8, CH-6006 Luzern, Switzerland. Good show, gang!

A very unique utilization of Slow Scan is materializing on the 20 and 40 meter bands in Cop MacDonald's New Directions Roundtable. This group gathers at 2000 GMT on 14.253 kHz and at 2230 GMT on 7163 kHz, both on Sundays. Slow Scan is used as an aid in presenting programs on some fascinating subjects and one soon finds himself studying the information presented on the screen, rather than just checking picture detail. I often tape the programs presented (which is 80% audio narration) and then listen back over them in detail on my cassette recorder while driving to work. Why not join in some Sunday . . . I think you'll like it.

Although I personally didn't make the Hyannis convention last September, I understand the Slow Scan development was very good. Cop MacDonald WØORX, presented an informative program on "Engineering of the SSTV Station" while Robert Suding WØLMD gave a presentation on Scan conversion and storage techniques. Robert also displayed his SSTV keyboard, which was a rollicking success. Venus Scientific was there with their new SS2 Monitor, and the first big showing of their fast to Slow Scan converter. Actually it is a form of Scan sampler; however, results obtained from the unit will prove fine. More on this later.

I've been putting off mentioning our poor band conditions for some months now, but it's beginning to look like things are going to stay this way a while longer, so don't despair – hang in there. (Often 20 meters is dead here in Alabama shortly after dark!) Surely conditions will improve soon and I'm sure we will find there will then be twice as many Slow Scan Stations and activity will again be tremendous.

Finally, I have an altitude correction on ATS-1, the weather satellite over Venezuela mentioned in the October column. It is 22,300 miles high, not 4000. Ditto ATS-3, whose location was somehow omitted. It is over the South Pacific, between Christmas Island and Hawaii.

. . .K4TWJ

For a
Socially Redeeming
message, write
P.O. Box 205,
Peterborough NH 03458

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

Late October brought several Es openings, which is very unusual for that time of year. The seasonal operators were missing but the regulars were on in force. W3QKV, WB9ETQ, W4GSD, W5BJJV and others were very much in evidence during the openings of the 17th, 21st and 24th. Bob WAØTXV tells me there were also several daytime openings during this period.

WB4OSN and W4GDS took advantage of the opening of the 24th to pass along preliminary information on a June contest DXpedition to 6Y5. Joe and Bob plus Jim K8BBN and others will be active from Montego Bay on 50 MHz and the hf bands during the week of the contest. They say "Hoppy" WB4BND won't be allowed to go along unless he gets married. I am afraid to ask why. Further details will be announced in a later column after the situation is firmed up.

I received a message via MARS from WA3EOP of the Itchycoo Park VHF Amateur Radio Club listing the dates of their annual "World Wide VHF Activity" as March 9th and 10th. I hope it's bigger and better than ever.

In a column last spring there was mention of a JA1 heard and recorded by WB4BVT. David lamented the lack of a callbook listing and wondered if someone had further information. As it turned out one of our readers "down under" reads and writes Japanese and has a copy of the Japanese callbook. He was kind enough to send me a translation which I forwarded to David in hopes he will be able to confirm reception. Unfortunately my filing system will not at this time produce the Xerox copy of the letter which puts me in the embarrassing position of being unable to thank the gentleman by name and call.

In the November column mention was made of signals heard on 50.158 by several stations in New England. Tom WB8KZD writes to say the signals heard were those of a Greek ship calling a Royal Navy station in Singapore. Evidently the signal was getting into the first (8.395 to 8.895 MHz) i-f of the SB-110. Tom also mentions a very useful book from which the above information came. About two years ago he bought a copy of the "Utility DXers Handbook" for $3.00. The address at that time was 401 Dewey, Evanston, Illinois 60202. I for one am going to order a copy.

Bob WB5ICJ has bought a Knight transceiver with a VFO and a groundplane antenna but reports having received only the local taxi. Is there anyone on AM within groundwave distance of Rayville, Louisiana who could get on and at least let Bob know his rig is working?

WB9ETQ of AT&R Inc., Wallace, Indiana, has designed a new 9-element wide spaced 6 meter beam which is being manufactured by Wilson. The gain is 19 dB, the front to back is listed as 45 dB (although Jack says his is over 50). VSWR is under 1.5:1 over the range 50.0 to 50.5. The boom is made of two 20' lengths of 2" tubing held together by a splicer. The elements are 5/8" in the center and reduced to ½" at the ends. The longest element is 118" – turning radius is 21' – wind load 4½ square feet. The weight is 35 lbs. I have personally heard two of these antennas "on the air" already and while I didn't have the opportunity to A-B them against another antenna I must say that in both cases the signal was outstanding. The price is $149 plus shipping.

.WAØABI

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you are interested, send *73* your name, address and phone number. Don't be bashful – remember, it's always easier when you have someone to give you that added bit of confidence.

73 would appreciate amateurs and clubs looking this list over and helping whoever they can. Do you remember when you needed help?

Kirk Adamson
Rt. 2 Box 48
Elma WA 98541
772-2644

Owen Spencer
1332 Grant St.
Longmont CO 80501
219-866-7383

Alicia Moore
119 East Grace St.
Rensselaer IN 47978

DX FOOTNOTES

Gus Browning W4BPD
Drawer "DX"
Cordova, SC 29039

Well so far I have not had any grumbling about the proposed "Super WTW", so I will get going on making up the DX spots we will count as "points" for this award. As long as possible I will try to steer clear from the word "countries" in this award, because we will most definitely be counting spots that is not really countries (is all those "places" on the DXCC "country" list "countries" ?-hi). So that some of you can start working towards your own Super WTW I will give you an "inkling" of some of the places will be. Every State in the USA, province in Canada, licenseing area in Australia, South Africa, oblisk in Russia, every island in the entire world (yes even Long Island, Catilina, each island in the Azores group, (or any other group of islands), their separation will not have anything to do with if they count or not in this award, just so they are actually separated. Every different nationality on the continent of Antarctica will count plus both the North Pole and South Pole, all this plus the usual DXCC countries and there will of course be other places added when the final list is made up and at times others will be added I am sure, because you cannot think of everything when its first being made up. We want this to be the Award to stop all other Awards ! Anyone who get to the top of our Super WTW can really say that he has Worked The World.

Now, to the regular WTW Award ! We are going to make some "adjustments" to our country list, adding a few here and there, and maybe some small changes in the rules. When I start printing the rules/score sheets for the new Super WTW, I will also print the same for the re-done WTW. May even try to combine both of them in the form of a small pamplet consisting of a number of pages which we will mail to those requesting an application blanks.

The DXing season is with us again and I hope the cold weather has not caught you with your antennas down. I warned you during all that nice, warm weather last summer to get with your antenna because it is not going to last too long.

Ten meters is again showing signs of coming to life since it was on a summer vacation last summer, and fifteen is going great guns. The lower frequencies are of course right in there because this is the kind of WX they love to propagate in.

If you chase DX (you must do it-you are reading this page) and want to really run up a score you are lucky. Not to many years ago you did this by listening hours and hours for that "new one", sometimes going for a few weeks to months later on when you had a sizeable score. These days there are numerous aids offered you, most of them at very reasonable charges. Quite a number of weekly, semi-monthly, and even a DX magazine. (that's mine !-The DX'ers Magazine). If you subscribe to all these you can work your DX almost effortlessly ! They will tell you who is active, what times of day they can be expected to come through, sometimes even they will tell you if it's long or short path. Plenty of good QSL info in most of them. In the form of DX tidbits you can get little sidelights about the DX that is active and actually on the air. You can find out about upcoming DX-peditions, when they can be expected to show up from their planned points of operations, the frequencies they plan to use and sometimes even their planned hours of operating, who will be their QSL manager (if they use that system of QSLing). And many other ways they can make your DXing a real "lead pipe" cinch if you read them carefully and make your DXing plans accordingly. You can get blank DX QSL cards to fill in yourself to send to that non-QSLing DX station (Ihave these on hand myself), and you can even get postage stamps (to glue on the above mentioned cards to use a good waterproff glue so no one can steam your stamps off ! Then now you are living in the day of the QSL Manager system of QSLing, and many DX stations have one of them and most QSL managers give you very fast service, then you get your cards fast ! Most of the cards come by air (especially if you send them a few IRC's. Naturally all these big, tall beams and those kilowatts make for better DXing the "easy way", too. About all I can say is: You modern DXers have it made if you use all the DX aids thats available to you. A lot different than when I was after DXCC certificate number 4 - which I finally made after beating my brains out, sneaking home during the day, staying up, sometimes all night. Oh yes ! You can get those DX stamps from W2AZX. He has stamps from most foreign countries. Then as another DX aid don't overlook such associations as the WWDXA, and then there are a number of "on the air" DX nets you can call in on after they say - "standing by for any non-member stations (or some other similiar instructions). Always remember the DX station is "running the show" and you play ball by his "rules" ! !

After reading the various propagation prediction boys charts and comments I have come to the conclusion that the present sunspot cycle is very very near its minimum, maybe it is a little past the bottom. They have to wait a while after the bottom has passed to be sure the spots are on the actual increase and not just a temporary thing. Lets all hope for the best because without those sun-spots the DX is just not there. But we have to admit that if the minimum has now passed it certainly didn't kill off all the DX because the past few years a lot of good DX has been worked We should know pretty soon now if we are in for more and better DX.

We now have someone living near Mount Athos. Our good friend W3CA has moved over there only about 25 miles from the Mount Athos border, in Greece. He has the callsign SY5MA and have been quite busy, giving out a new country to a lot of DX'ers. His QSL manager is W4KA.

A group of VQ9's from the Seychelle Islands made a successful DXpedition to the island of Farquhar a few months ago. Quite a number of thousands of contacts was made. To get from one island to another would seem to be a very simple task, but the business of getting a boat at a reasonable price can be a "lingering" thing that can stretch out for months. I know because I have "been there". The boat owners will promise you almost anything, and then they start the "putting off", till next week and if you stick with them you might eventually get to that other island. If you just want to stop by an island for a few hours or maybe ½ day or so it's easier, but when you want to be on the island for a few days or longer you have "problems". The various boats that go between the islands only make a brief stop at each island and they are wide apart stops, the next boat may be two or three or more months away. So don't be to critical of the delays in some of the plans of the boys over there. Things move slow on most of these islands and the boat owners are not an exception.

If you are a real "DX'er" you might start tuning between 14280 to 14290 kHz every day between the 2230 to 2400 GMT. The WWDXA meets there and you can get in on some good DX tips, even at times a good DX station may call in and work all those on frequency before he moves away (or to bed, or work, etc.)

We still need some WTW and later on our new Super WTW checkpoints. Maybe your club would be interested. Drop me a line for details please.

That's it for now, CU next mo.

TECHNICAL AID GROUP

The Technical Aid Group is a group of hams who have indicated a willingness to share their knowledge and skills with others. They have volunteered to be of service to fellow hams and do so without compensation. If you have a technical question, look over the list to see who has competency in the area of your question. For many of the TAG members, descriptions of all areas of expertise would be lengthy, so an abbreviated description is given. When stating your problem, give as much information as possible and clearly state the difficulty. Enclose a SASE for reply.

For those hams who have a desire to share, the TAG is the thing for you. Send a brief note requesting the membership form, fill it in and send it back. It asks a few questions about your qualifications, and there is a check-list to indicate your fields of competence. These cover all modes currently used by hams, antenna design and theory, transmitter and receiver design for HF, VHF, and UHF, logic, ICs, general help, and other areas. As more members are added, their names and addresses will be published.

Robert Perlman WB2VRW, 3 Josten Place, Hudson NY 12534. Electrical engineering student. Will help with Novice transmitters and receivers, and any help for beginning hams.

Thomas Laffin W1FJE, Box 133, Hillsboro NH 03244. Radio communications technician. Special aid to ex-CBers and those who need terms in easily understood terms; aid to Novices and Techs interested in MARS, RACES, CD, and CAP; how to build and scrounge parts; assistance on ham history, ATV, microwave, and general help.

Bill Daly WB8OQC, 1447 Old Salem Ct., Birmingham MI 48009. Works for Lafayette Radio. Specializes in 2M FM, solid state, VHF/UHF antennas, receivers and transmitters.

J. Bradley Flippin K6HPR, 116 Montecito Ave., Apt. M., Monterey CA 93940. Electronic engineer. Help with RTTY, data processing and programming, general.

Ira Kavaler WA2ZIR, P.O. Box 54, Flatbush Sta., Brooklyn NY 11226. Electrical engineer. Assistance offered in theoretical aspects of electricity and electronics from dc to UHF, design of equipment, computer programming, and signal circuit (failsafe) design.

John Teich WB2JAE/6 Ruddock, Cal Tech, Pasadena CA 91109. Novice and rig problems, solid state and logic circuitry.

David Felt WB6ALF, P.O. Box 261, Sierra Madre CA 91024. Electronics engineer. Qualified help in logic, digital and analog design, solid state, AM and TV.

Robert Groh WA2CKY, 65 Roxborough Rd., Rochester NY 14619. Communications engineer. Bob can lend a hand in HF and VHF transmitter and receiver design as well as solid-state logic and digital techniques.

Carl Miller WA6ZHT, 334 Paragon Ave., Stockton CA 95207. Computer technician. Carl's specialty area is solid-state QRP.

George Daughters WB6AIG, 1560 Klamath Dr., Sunnyvale CA 94087. Research associate. HF transmitter and receiver, SSB, and solid state, are George's fields.

D. Hausman VE3BUE, 267 Northcrest Pl , Waterloo, Ontario, Canada. Student. Novice transmitter and receiver problems as well as logic, digital techniques and ICs.

Hugh Wells W6WTU, 1411 18th St., Manhattan Beach CA 90226. Electronics instructor. Hugh can help with AM, Novice problems, VHF-UHF receivers and converters, solid state, test equipment, FM and repeaters, and general help.

Charles Hill WA7LQO, 4005 Campbell St., Baker OR 97814. Student. TV, Novice transmitter problems, and logic.

John Perhay WAØDGW, Route 4, Owatonna MN 55060. EE technician. John will help with RTTY, AM, SSB, Novice gear, HF transmitters and receivers, solid state, ICs, and test equipment.

Ron Thomas W8QYR/6, 1928 S. Beverly Glen Blvd., Apt. 12, Los Angeles CA 90025, tel. 556-2721. Commercial communications experience. Ron is willing to assist with beginners' problems, theory and regulations.

Jim Jindrick WA9QYC, 801 Florence Ave., Racine WI 53402. Consulting engineer. General help as well as HF, VHF, and UHF antennas, transmitters, and receivers.

William Welsh W6DDB, 2814 Empire Ave., Burbank CA 91504. Electronic engineer. Beginner's problems, code instruction, theory and regulations.

Ken Knecht W2GYF, Box 39, Clintondale NY 12515. Televsion engineer. TV video, logic, and digital techniques.

Tom O'Hara W6ORG, 2522 S. Paxson Lane, Arcadia CA 91006. Communications engineer . RTTY, TV, AM, SSB, VHF antennas, transmitters and receivers for HF through UHF, solid state, and general help.

Bruce Creighton WA5JVL, 2517 Metairie Ct., Metairie LA 70002. Electrical engineer. Antennas, Novice problems, solid state, logic, digital techniques, test equipment, and general help.

Tom Borok WB2PFY 215-33 23 Rd., Bayside NY 11360. Student. Tom is especially qualified to help Novices with their problems with transmitters and receivers, HF and VHF antennas, HF receivers, test equipment, and surplus, Morse code instruction.

Roger Taylor K9ALD, 2811 William St., Champaign IL 61820. Engineer. Roger is adept with AM, SSB, antennas, solid state, logic and digital techniques, ICs, test equipment, and other general help.

Orris Grefsheim WA6UYD, 1427 W. Park St., Lodi CA 95240. TV technician. Orris is capable of assisting in all fields of amateur work, DC through UHF, logic as well as Novice help.

John Allen K1FWF, 112 Edgemoor Lane, Ithaca NY 14850. Technical director. John's areas of assistance are VHF and UHF antennas, receivers, and transmitters, solid state and digital techniques, ICs, and SSB.

Eugene Fleming WØHMK, 1327 Prairie Rd., Colorado Springs CO 80909. Radio and television repair experience. Eugene will be glad to help with HF transmitters, receivers and test equipment. In addition to letters, he will accept open reel tape and braille correspondence.

Roger A. Baim WB9BDP, 2753 W. Coyle, Chicago IL 60645. Electrical engineer. Roger conducts Novice and General Class code and theory courses and will be happy to assist those seeking licenses.

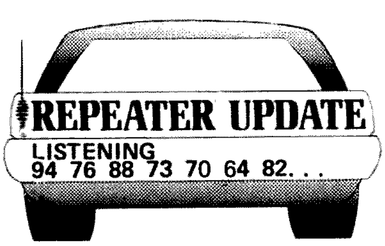
73 REPEATER ATLAS REGISTRATION

REPEATER CALL (WR only)	FORMER CALL	LOCATION (City)	STATE

INPUTS	OUTPUTS	TT Wh TB PL	FM AM RTTY	AUTO PATCH	ERP	
		Hz				USEFUL RANGE (RADIUS)
		Hz				
		Hz				EQUIPMENT
		Hz				☐ SPLIT SITE
		Hz				ANTENNAS & HEIGHT ☐ DIPLEXER

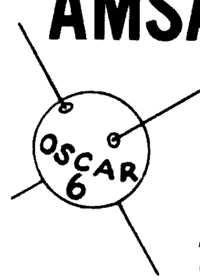
REPEATER GROUP/SPONSOR	TRUSTEE	ID–TYPE OR MFR.

☐ I certify that I have received no outside assistance while completing this form.		
DATE	SOURCE (NAME/CALL)	SPECIAL OR EMERGENCY FUNCTIONS



CA	WR8ACU	Fresno	148.34–148.94
CO	WRØACM	Denver	146.04–146.64
			444.6–449.6
CO	WRØACL	Denver	146.04–146.64
			146.28–146.88
FL	WR4ADC	Daytona Beach	146.34–146.94
IA	WRØABY	Clarinda	146.37–146.97
IL	WR9ABB	Chicago	223.34–224.94
			448.6–443.6
IL	WR9ACK	Oaklawn	146.26–146.88
IN	WR9ACJ	Ft. Wayne	146.01–146.61
KS	WRØACG	Topeka	146.34–146.94
KS	WRØACH	Lawrence	146.16–146.76
NC	WR4ADS	Beulaville	146.34–146.94
NC	WR4ACM	Lenoir	146.25–146.85
NC	WR4ACJ	Mt. Airy	146.37–146.97
NC	WR4ADE	Reidsville	146.25–146.85
NY	WR2ACO	Flushing	147.69–147.09
NY	WR2ABO	Rome	146.28–146.88
NY	WR2ABV	Schenectady	146.46–146.94
NY	WR2ABZ	Troy	146.22–146.82
OH	WR8ABD	Cleveland	146.34–146.94
PA	WR3ACE	New Holland	146.01–146.61
			223.34–224.94
PA	WR3ACO	Churchville	222.98–224.58
SC	WR4ADG	Caesars Head	146.01–146.61
SC	WR4ABA	Columbia	146.28–146.88
SC	WR4ABB	Augusta	146.13–146.73
TX	WR5ABD	Dallas	146.22–146.82
WA	WR7ACB	Chehalis T1950	146.34–146.94
PANAMA			
	HP1PC		146.34–146.94

AMSAT NEWS



Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

On October 15 this message was read over OSCAR 6, around every portion of the earth commemorating OSCAR 6's first birthday.

"This is an official bulletin from AMSAT concerning the sixth amateur radio satellite launched one year ago. After one full year of operation and over 4500 orbits in space, the AMSAT-OSCAR 6 spacecraft appears to be in good shape in spite of some battery degradation. It is expected that the satellite will continue to remain useable for some months to come. As the battery becomes weaker, it will be increasingly important that everyone cooperate in using the satellite repeater only during the scheduled ON periods. AMSAT maintains an OSCAR 6 Users List of stations successfully communicating through the satellite. The list now numbers over 1800 calls in at least 74 countries. All stations who have not yet reported their OSCAR 6 operating activity are urged to send their reports to AMSAT, Box 27, Washington, D.C. 20044. In return, you will receive an AMSAT-OSCAR 6 QSL card and a Satellite Communicators' Club Certificate. Work is now progressing on AMSAT-OSCAR-B, which is now approved for launch next spring.

October 15 marked the first-year birthday of AMSAT-OSCAR 6, amateur radio's newest and longest lifetime satellite in space. The spacecraft continues to operate successfully, having surpassed our lifetime objective of one year.

During its first year, it is estimated that on the order of 100,000 or more contacts have been made through AMSAT-OSCAR 6's two-to-ten meter repeater, and amateurs in at least 72 countries have been participating in this new mode of amateur communications. Experiments have been continuing in order to learn more about radio wave propagation and space communication techniques, and the American Radio Relay League and NASA are now working together to use OSCAR in the schools.

For many of us, the past year of satellite activity has been one of excitement, fulfillment and learning, as

well as discouragement at times. The sixth amateur satellite is another step toward the goal of an operational Amateur Satellite Service. As a learning experience, AMSAT-OSCAR 6 has taught us new operating skills, and through its faults (and our own) has shown us how to take the next step – and how to do a better job next time.

AMSAT-OSCAR 6 has verified our conviction that amateurs are capable of designing, building and operating long-lived communications spacecraft. It is an operational challenge as well as a design achievement to be able to successfully maintain the life of a spacecraft which has a total power budget of only three watts, for this length of time.

We are grateful to the National Aeronautics and Space Administration for making the launch of OSCAR 6 possible, and to the many organizations and individuals who have contributed either hardware, financially, or their personal time. It is only the total effort that has made the AMSAT-OSCAR 6 project a successful one."

Orbital Information

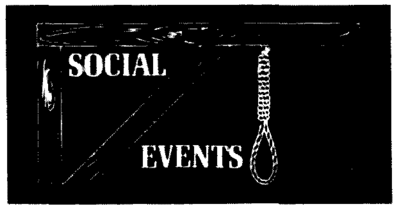
Orbit	Date January	Time (GMT)	Longitude of eq. Crossing°W
5539	1	0024.5	53.8
5552	2	0119.4	67.5
5564	3	0019.4	52.5
5577	4	0114.3	66.3
5589	5	0014.2	51.2
5602	6	0109.2	65.0
5614	7	0009.1	50.0
5627	8	0104.0	63.7
5639	9	0004.0	48.7
5652	10	0058.9	62.4
5665	11	0153.8	76.1
5677	12	0053.8	61.1
5690	13	0148.7	74.9
5702	14	0048.6	59.8
5715	15	0143.6	73.6
5727	16	0043.5	58.6
5740	17	0138.4	72.3
5752	18	0038.4	57.3
5765	19	0133.3	71.0
5777	20	0033.2	56.0
5790	21	0128.1	69.7
5802	22	0028.1	54.7
5815	23	0123.0	68.4
5827	24	0022.9	53.4
5840	25	0117.9	67.2
5852	26	0017.8	52.1
5865	27	0112.7	65.9
5877	28	0012.7	50.9
5890	29	0107.6	54.6
5902	30	0007.5	49.6
5915	31	0102.5	63.3

As a side note, amateur satellite communications have been internationally approved on:

7.0–7.1 MHz 144–146 MHz
14.0–14.25 MHz 435–438 MHz (A)
21.0–21.45 MHz 24.0–24.05 GHz

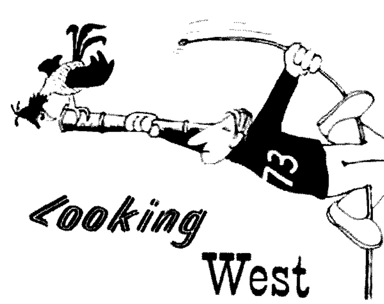
(A) This spectrum shared with another service; all others are exclusively amateur worldwide. Tele-command required on this spectrum.

. . .WB8LBP



LAKE COUNTY BANQUET

For the 21st consecutive year, the Lake County Amateur Radio Club, Inc., proudly announces its annual banquet. The date is February 9, 1974, and the time is 6:30 p m., CST (we start on time). The place is The Scherwood Club, 600 E. Joliet St., Schererville, Ind. (two miles east of Rt. 41, ¼ mile north of Rt. 30). Chicken dinner – all you can eat – awards, fellowship, speeches, entertainment, gifts. Cost – $6.00 per ticket. Come. Bring your wife or girl friend. Tickets available from ticket volunteers or from the ticket chairman, Herbert S. Brier, W9EGQ, 385 Johnson St., Gary, Ind. 46402. Positively no tickets sold at the door!



Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA

I suspect that most people would find the ambient noise a bit greater than they normally enjoy, but to my ear the sound of four powerful Pratt and Whitney engines is pure music. We are currently on board a gleaming white and blue bird heading toward New York at close to 650 mph. Flying in any of its varied forms has always been a stimulant to me and though I have flown many thousands of miles both commercially and privately, I always find it exciting. I guess that Richard Bach in his acclaimed book, "Jonathan Livingston Seagull" expresses this feeling in words that I could never hope to duplicate. I can only equate flight with freedom and freedom with flight. In my mind the two are inseperable. So here I sit at 38,000 feet above the terrain below sharing my feelings and the latest happenings in the southland world of VHF FM with you. It's time to continue on to the latter.

The longest running controversy in the Los Angeles area has been whether or not to permit a .34–.94 repeater. Since I have discussed the pros and cons of this situation at length in past issues, I wont go into them again at this time. However, in the past few weeks the situation has taken on a new twist, one that may eventually make a .34–.94 repeater out here a reality On October 21, the Southern California Repeater Association voted to open this previously unassigned pair for study of eventually putting a repeater on that channel. It must be emphasized that this is not a green light for anyone who wants the pair to go ahead and put his machine on the air. As Dick W6OLD explained it to me, at this time the SCRA will accept "proposals" for a repeater on that set of frequencies, and will study them to see if they meet certain parameters. These parameters have not been set yet, but I suspect that the next time the SCRA technical committee meets they will be worked out. As you can probably guess, reaction has been mixed within the local amateur FM community ranging from cheers to cat calls, but that was to be expected. Whatever the final action is on this question, we have definitely taken the first step in finally solving the .94 problem, and the SCRA is to be commended for its positive action. As I have said in the past, the SCRA is one organization that is going to make it. They are not afraid to think positive.

A new concept in supporting a repeater is being tried out here, and at the outset it looks as if it is going to be successful. The Mt. Wilson Repeater Association is unique in many ways, but its most outstanding quality is that it owns no repeater. It is strictly a user sponsored support group set up initially to supply operating capitol for the WR6ABE repeater and was the brain child of one of the ABE users, Bob Thornberg WB6JPI. It began late last March when K6OQK who owns the aforementioned machine announced that he had received permission to erect a new antenna system atop the tower they share with one of the local FM broadcast stations. Funds were needed fast to purchase a Stationmaster, duplexer and hard line. In his spare time, Bob set up a loose-knit organization that he named the Mt. Wilson Repeater Association, chiefly because the ABE repeater is located atop Mt. Wilson. One newsletter and a few weeks later, he had raised some $1200 and the new antenna with its associated equipment was recently installed.

An idea had been born; user support of a repeater that would not

interfere in any way with either the technical development or administrative decisions of the repeater's sponsor-owner. The users of ABE seemed to like it and this inspired Bob to continue the MWRA, still unofficially. In August, the organization sponsored its first social event; a Hawaiian Luau. Again this event was more successful than had been imagined by its sponsors. By this time the "unofficial board of directors" had grown to include Vic Lifland W6IWV and Russ Soloman WA6DUC. Finally, late in October, a meeting was held to in some way formalize the organization, and decide exactly what direction the organization should take. The outcome of this four hour meeting was the decision to keep the MWRA as it was, but dividing the responsibility for its operation among a number of people so as to take some of the lead off Bob's shoulders. It was also strongly emphasized that the organization was to function only as a social and support group and that all were left to its owner. As a matter of fact, it was decided that the MWRA would leave the door open to support other amateur activities ranging from a 40 meter CW to a 220 repeater. It was left to the members to decide the direction. Present plans call for a Christmas party, a day at Disneyland in January and continued support to WR6ABE. The future may hold far more interesting things though, in that such far-reaching ideas as chartering a plane for a mass vacation trip to Japan were also discussed.

Membership in MWRA is easy. All you have to do is show up one day on the WR6ABE repeater and you are a member. There are no monthly dues or yearly dues and the prime objective is deriving the most enjoyment possible out of our hobby. So, the MWRA, now an official organization with a president, veep and such, will continue and if things keep going as they have, it may well wind up as one of the largest repeater associations in the country. Heck, it already boasts WB2PQR in Brooklyn as a member, and Abe even attended the Hawaiian shindig. Not bad for a repeaterless repeater association.

Six meter activity in this area seems to be on the upswing. It seems that more and more people are pulling those Gooney Boxes, 99ers and alike, out of moth balls and firing them up. For those of you who have never operated six, it's a band that combines most of the attributes of two with a good deal more possibility of DX in the form of sporadic E and F2 skip.

It's also a great band for mobile and its only major drawback is in areas where there is a local TV station operating on channel two. As a matter of fact, I have yet to come across a sure all around cure for six meter TVI. (Actually the best method I found to date has been SSB. Not that it eliminates TVI, it just makes it a lot harder for you to be found by your neighbors carrying those kegs of tar and feathers). Well, let's face it, if we don't use six it may well go the way 11 meters went and you know about 220. This upswing in local six meter activity has given me the idea of a combined AM-FM repeater for the band and it may well become my next project. The idea is not new; two inputs – one AM, one FM and an FM transmitter. What better way to stimulate activity on six and at the same time introduce the world of FM communications and repeater type operation to those who may still not

73's WORLDWIDE SALES REPRESENTATIVES

U.S. AREA REPRESENTATIVES

New Mexico/West Texas

Ambrose G. Barry, W4GHV/5
1010 Juniper Avenue
Alamogordo, New Mexico 88310

Midwestern States

Gloria M. Ligon, K8WKE
47160 Condor Street
Utica, Michigan 48087

DX REPRESENTATIVES

BCN Agencies Pty. Ltd.
178 Collins Street
Melbourne 3000, Victoria
Australia

The Wireless Institute of Australia
478 Victoria Parade
P.O. Box 36
East Melbourne, Victoria
Australia

Carlos Rohden
Caixa Posal 5004
Sao Paulo, S.P.
Brasil

Jim Coote
56, Dinsdale Avenue
Kings Estate
Wallsend
Northumberland, England

Radio Society of Great Britain
35 Doughty Street
London WC1N 2AE, England

Short Wave Magazine
55 Victoria Street
London, SW1, England

Bryan Fogerty
Irish Radio Transmitters Society
9 Wellington Street,
Dun Laioghaire, Eire

Wireless Services, P.U.Sukhadia,
1/16, Shantinath Bhuvan,
427, Sion Road
Matunga, C. Rly.,
Bombay 19, India

Orion Books
13-19 Akasaka 2-chome
Minato-ku
Tokyo 107, Japan

Tama Electronics Co., Ltd.
Towa Building 502
515 Higashi Oizumi, Nerima-Ku,
Tokyo 177, Japan

Sun Electron Corporation
15–20 Takaban-1-chome
Meguro-ku, Tokyo 152, Japan

Kushal Harvant Singh
83, Aulong Road off Stephens Road
Kampong Boyan
Taiping, Perak, Malaysia

Gordon and Gotch Ltd.
P.O. Box 584
Auckland, New Zealand

G. H. Gillman
Smarts Road
Waikuku RMD
Rangiora, North Canterbury
New Zealand

New Zealand Assn. of Radio Transmitters
P.O. Box 1459
104 Hereford Street
Christchurch, New Zealand

Harold C. Leon
P.O. Box 61141
Marshalltown, Transvaal
South Africa

South African Radio Publications
P.O. Box 2232
Johannesburg, South Africa

South African Radio Relay League
P.O. Box 3911
Cape Town, South Africa

Julio Antonio Prieto Alonso, EA4CJ
Donoso Cortes No. 58
Piso 50, Letra B
Madrid 15, Espana (Spain)

All Europe,
except Great Britain & Ireland:

Eskil Persson, SM5CJP
Frotunagrand 1
194 00 Upplands Vasby
Sweden

be familiar with it. Your ideas on this subject would be greatly appreciated. Anyone have a spare mountain top they're not using in this area?

Below I can see the famous Verrizano Narrows Bridge and the vast expanse of the great city of New York. We are at about 3,000 feet and have slowed to about 180 knots. It has been a most pleasant flight and in about 10 minutes will come to an end when the man in the "front office" plants the mains firmly on "the numbers" at good old JFK International. It's a strange feeling seeing this all again, but more about this next month when "Looking West" takes a peek east. Time to fasten our seat belts. *Hello New York, HVK is back!*

...WA2HVK

Tom DiBiase WB8KZD
708 6th Avenue
Steubenville OH 43952

CONTESTS

Jan. 15–17	OOTC QSO Party CW
Jan. 29–31	OOTC QSO Party, Phone
Feb. 9–10	Ten Ten International Net Contest
Mar. 9–10	Worldwide VHF Activity

THIS MONTH
OOTC QSO Parties

The CW Party is from 2300Z Jan. 15 to 2300Z Jan. 17. The Phone party is from 2300Z Jan. 29 to 2300Z Jan. 31. Complete rules and log sheets for SASE to G.G. MaConomy, W6BUK, Space 45, 36770 Florida Ave., Hemet, California 92343.

Results of the 1973 New Jersey QSO Party: Top four out-of-state: WA2FIQ/2,!, WAØTKJ, K1OME, WB2RKK/1. Top four NJ – WA2URS, WB2MVI, WA2EUO, WB2RJJ.

Results of the 1973 Illinois QSO Party: Top five out-of-state: WA3PWL/Ø, WAØTAQ, WB2HIL, W6MYP, W3ARK. Top five Illinois: WB9GFC, WB9HAD, W9LVH, WB9HHK, WB9JEP.

Results of the 1973 QRP ARCI Contest: Top ten: K8BHG, K8EEG/Ø, KØFRP/6, VE3KZ, WB4TNB, WBØDAV, W3ARK, K2MFY, W3RYV, WA8VPD. Closest race was for 8th Place with MFY edging out RYV by a scant 630 pts.

...WB8KZD

CX-7A NEWS

Ed Jay, the entrepreneur of Signal/One, is back in California, after some business in Sweden – and informs us that he hopes to again regain the right to manufacture the rig. The bankruptcy proceedings were held in late September. Ed says that owners should be careful about repairs on the rig – and to trust authorized dealers, but not much else. Don Payne has a good supply of parts and expertise. CX-7 books can be purchased from Thomas Advertising, Suite 210, 715 Silver Spur Road, Rolling Hills CA 90274. Ed mentioned in particular that some problems had arisen from CQ's buddy, Larry Pace, and CX-7 repairs.

K8NLM SERIOUSLY HURT!

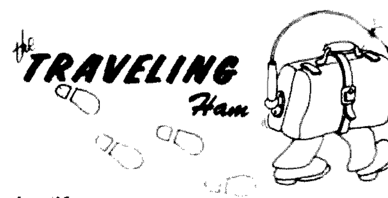
A note from our very good friend Frank Warnock K8NLM brings us some details of his terrible accident at the Dayton Hamvention. Frank, who was the program chairman of the 1973 Dayton Hamvention Midcars meeting (and who arranged for me to speak to the Midcars people there) was getting things gathered up at the end of the meeting and the step going up to the platform turned as he did, throwing his back against the edge of the platform.

Frank was rushed to the hospital from the Hamvention and the diagnosis was a splintered vertebra with a crushed disc. He was in the hospital for two weeks – out for a while – then back for two weeks in June and two more weeks in July for an operation on the lower back. Frank is home again, but it will take a long time to heal.

Friends might drop Frank a QSL card at 1109 Graystone, Dayton OH 45427. Frank is a peach of a guy.

TWA SERVES

While on the way to Dayton the other day I was fed something containing water, hyrogenated coconut oil, sugar, soy protein, isolate, dipotassium phosphate, stearoyllactylate, salt, polysorbate 60, imitation flavor, beta carotene. What was I eating?



Joe Kasser
1701 East-West Highway, Apt. 205
Silver Spring MD 20910

Some months ago I wrote about the cost of driving into New York City. WA2CUR wrote in with some comments. He writes that it can cost a bundle to drive into and around the area, but only if one takes the toll roads. He continues as to how to get around the toll roads as follows:

I-80 is about 98% complete and the rest of it should be finished off by the time this appears in print. I-280 was opened last July, I-78 is about 90% complete, the remaining sections to be completed are in the Newark area.

He says that if you drive into New York on I-78 (east) go STRAIGHT past the sign that says "local traffic only, take 287 to NYC–Newark." Do NOT take 287 to US-22 for New York–Newark, instead go STRAIGHT on 78. It is built for yet another 30 miles or so, and will save you a lot of time. At its temporary ending the way to US-22 is well signposted.

Going out of New York City on 78 West, you can apparently "sneak" onto the part that is open before the rest of the crowd, and also save a lot of time by getting off of US-22 before Plainfield and going up a mountain road on the right. This all takes place almost at the site of the Greenbrook 34–94 repeater.

Going south, I-95 is being rebuilt for free use. It is already open through to Philadelphia and crosses the Delaware for free. It will run through New Jersey up to 287 and then link up with the old I-95 (turnpike).

If you take the New Jersey turnpike south, you can get off about halfway down and take I-295. It runs parallel to the turnpike and has as many if not more lanes as the turnpike and is free. It also leads to the free bridge.

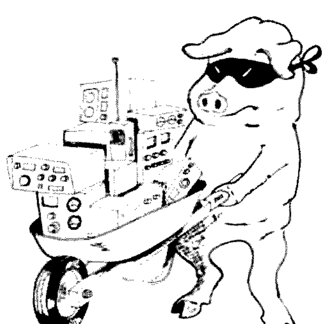
If you are going north to Connecticut. Massachusetts or New England areas, take 684 to 84. It is much better than I-95, is faster, has less traffic and has no toll booths. WA2CUR said that he made a few runs from NYC to Portland, Maine in about five hours and to Vermont in four hours taking 684 to 84 to 91, all free.

How about that, it just goes to show how they sock it to the out-of-towners. Thank you for writing in, WA2CUR, and anyone following these

instructions and getting lost, write to WA2CUR.

Changing the subject to more technical things, a QRP transceiver using a direct conversion receiver can be built using 8 to 9 transistors. Many designs have already been published for this type of rig. I have one and have already worked a thousand miles per watt using the breadboard version on forty. These rigs are cheap and can be powered off flashlight or car batteries. Could not some scheme be set up to build such rigs and send them to the developing countries to promote and encourage amateur radio? There rigs can be built for $10–$20 by the average ham. That is cheap enough so the traveler visiting such a country could use the rig during his stay, and then leave it there as a gift to the local club. Since the rig is so inexpensive, customs duties or entry taxes should be within reason and suitable crystals can be obtained on the surplus market at very reasonable rates for the simplest rigs. A further effect of propagating this technique will be that if the developing countries come on the air using QRP-CW rigs the use of CW will be given a shot in the arm and a real incentive for operating CW will exist. What do you think?

. . .G3ZCZ



The Hamburglar STRIKES AGAIN!

List from Past Issues: Mfr., Model, Ser. No.	Owner	Issue
AF68 No. 10888	K5LKL	1/73
PMR8 No. 10918		
M1070 pwr supply		
Trio TR2200 No. 241969	WA2ZBV	1/73
Clegg 22er No. 1900-578	WIDHP	2/73
Standard 826M.No. 112007	WA8PCG	3/73
FM27B No. 27013-1141	W2LNI	4/73
FM-144-10L No. F459	WA6WOA	4/73
NPC 107m pwr supply		
2, 5AJ-IPL Onan Gen., No. 327885		
R4B No. 11578G	WA8GVK	6/73
T4XB No. 17801 G		
W4 wattmeter No. 8390		
Swan 250 No. F154806		
Swan ac pwr. sup. No. 0653556		
HR-2 No. 04-C2879	W6GSR	6/73
SB-34 No. 211828		
STD 826 No. 011268	WA2FSD	6/73
HT220 No. GJ7327	State Univ. of NY (Albany)	6/73
Yaesu FT-101 No. 82G12279/CW	W4GF	7/73
HR-2 No. 0302030		
Clegg 27B No. 72013-1068	W3BXL	7/73
Std. 826MA No. 208078	WB2DEW	7/73
Drake ML-2 No. 10582	W3MSN	8/73
Tektronics 453 Scope	WB2FZU	8/73
Sonar FR-2528 No. 21-4250	Doherty	12/73
Std. src-851-SH No. 9725		
Std. src-707C No. 2833		
TPL PA-6-IDE No. 1092		
RP MEA-22 No. 212		
Two Larsen antennas		
Swan 270 No. M-252616	W4NTB	12/73
Std. src-146A No. 208070	W7DKB	12/73

TOUCHTONE FOLLIES

HERE WE GO ROUND THE MULBERRY BUSH

4 4 4 2
Here we go round
2 6 6 2 4
the mul-ber-ry bush
4 8 8 8 8
The mul-ber-ry bush
6 . 2 4 4 4
The mul-ber-ry bush
4 4 4 2
Here we go round
2 6 6 2 4
the mul-ber-ry bush
4 8 8 6 8 4 4
So ear-ly in the morn-ing

AU CLAIR DE LA LUNE

4 4 4 0 6 8
Au clair de la lu-ne
4 6 0 0 4
Mon a-mi Pier-rot
4 4 4 0 6 8
Pret-e moi ta plume
4 6 0 0 4
Pour e-crire un mot
4 4 4 0 6 8
In the eve-ning moon-light
4 6 0 0 4
My good friend Pier-rot
4 4 4 0 6 8
Lend to me your quill-pen
4 6 0 0 4
Just to write a note

JINGLE BELLS

6 6 6 6 6 6
Jin-gle bells, jin-gle bells
6 # 7 8 6
Jin-gle all the way
9 9 9 9 9 5 5
Oh, what fun it is to ride
5 5 5 7 4 5 6
In a one-horse o-pen sleigh

OH, SUSANNA

4 8 6 6 9 6 8 7
Oh, I come from Al-a-bam-a
7 8 6 6 0 * 8
With a ban-jo on my knee
4 8 6 6 9687
I'm goin' to Louis-i-a-n-a
8 6 6 0 0 4
My true love for to see
9 # 6 6
Oh Su-san-na,
3 2 1 2 3
don't you cry for me
4 8 6 6 9 6 8 7
For I come from Al-a-bam-a
7 8 6 6 0 8 7
With a banjo on my knee

QSL CONTEST

Robert Mielke WB6GEX wins the January QSL Contest with a design patterned after (he can't fool us) the California Freeway system. Win a one year subscription to 73! Send your entry to: QSL Contest, 73 Magazine Peterborough NH 03458.

QTH CHANGE?

To be absolutely sure that 73 will follow you to your new QTH, try to notify our Subscription Department at least 8 weeks in advance of your move. Please include your old address and call as it appears on your current mailing label — or better yet, send the label itself.

OLD ADR (or mailing label)

NAME ______________ CALL ______

ADDRESS ______________________

CITY __________ STATE ______ ZIP ______

NEW ADR

NAME ______________ CALL ______

ADDRESS ______________________

CITY __________ STATE ______ ZIP ______

(W2NSD/1 cont. from p. 4)

whole idea of saving these dollars and has been making life miserable for the larger income tax companies

Painless Taxes

Since most income taxes are withheld by the employer, they are money that we never see and is unreal to us. Our take home pay is our real pay and that is all that we feel that we are paid for our work. The much larger number is some sort of bookkeeping figure and not real. This is a great system for the IRS for it hides the ugly fact of their taking money out of our pocket quite effectively.

If the old system of paying up income taxes at the end of the year was reinstated you can bet that a lot more people would be uptight about the enormity of the tax bill and would raise hell with their Congressmen about both government expenses and the IRS ways of collecting them.

For instance, take the short form of reporting at the end of the year. Tax experts estimate that this dupes millions of people out of legitimate refunds that they would otherwise get. It is painfully obvious that the IRS not only wants to keep this money that was overpaid, but will go to great lengths to prevent tax firms from helping people to get back what is rightfully theirs.

A Book is Needed

The horror stories of innocent people harassed and crushed by the IRS are so numerous that it would take a fair sized book just to scratch the surface. Thousands of people get a screwing every year and some cases are so blatant that it is a national disgrace. The press for the most part is terrified of the IRS and cooperates by refusing to publish their stories. The courts go along with the screwing through the fear of the judges and the inability of most taxpayers to defend themselves once the IRS has shut off their credit. It is a dirty story and it needs to be told. Congress must be awakened to this situation.

IRS NEWS

The November editorial mention of the IRS and its sometimes questionable actions brought in considerable mail and phone calls. . .all complimentary.

One reader told about the time that he had been running a small business and suddenly got a visit from the IRS with a demand for immediate payment of the company's quarterly payroll witholding account. No pay would mean that the paddlock would go on the door right then!

Our hero explained that he had paid the account on time, had the cancelled check to prove it, and had already sent in copies of the check as proof that he had paid, in addition to a second check with a penalty payment sent in protest. It was difficult to believe that after paying the bill, re-paying it with an alleged penalty, and including a copy of the original cancelled check that the IRS was ready to close his business down.

Eventually he got back the two extra payments and the fines. You can bet that this is one chap who has little use for the IRS people and the way they throw their weight around.

GIVE 'EM HELL

One of the responses to the November editorial on the IRS persecution complex was from a newspaper which wanted to reprint the piece. Fine . . . no, great! The more people who know what these scoundrels are doing the better. The way to fight an intrenched bureaucracy like this is with truth . . . and to get Congress to put the brakes on.

If you have any local paper that would like to run this series or any part of it, we have edited copies available to them which leave out the business about 73 Magazine which would only confuse the general public. This series is available at no charge and will continue until the case against 73 Magazine and Wayne Green is settled. There is enough data to fill a book already, and readers are pouring in more every day.

Let's help make this country safer for the small person and not just for the rich . . . let's get the facts about the IRS and their dirty work out where it can be seen.

NEW BAND AVAILABLE

As the last few holdouts on two meter AM move on up to the FM end of the band the lower two MHz is developing into a wasteland. Experience has shown us that as soon as anything like this has remained unused for a short while there are vultures just waiting to swoop down . . . a la the CB proposal for amputation of the 220 MHz ham band, starting first with the top MHz.

Unless some way is found to get Walker to back down on his firm resolve to limit repeaters to the top two MHz and no more, the repeater channels will inexorably grow more and more crowded and the rest of the band more and more deserted.

Obviously something will have to be done about this.

It may be that the concept of simplex channels within the repeater allocation of the band is a luxury that will have to go by the boards. Up until the freeze on new repeaters, courtesy of the paperwork curtain raised by Walker, several repeaters were starting to edge into the channels held back for simplex .most of them using a one MHz split, and most in areas where the 27 normal repeater channels were already in use or spoken for.

Obviously it is possible to start using frequencies below 146 MHz for FM simplex communications. The Amsat band has interfered with this a bit with its no-man's land request for the 145.9–146 MHz segment.

Perhaps it is time to rethink the possibilities of permitting some narrowband television experiments – perhaps with a 100 kHz limitation. There are several techniques that are being developed and they should have a chance to be worked on over the air. Limiting them to 450 MHz has kept any practical development from emerging.

Some years ago a petition was put into the FCC for such experimentation on two meters. The ARRL bitterly opposed it and the FCC went along with them. The main result of this is that there is not yet a narrowband television system. Many amateurs who have done exploratory work in this field are certain that a true narrowband television system can be devised which will permit fast scan television, perhaps even with color, within a 100 kHz bandwidth! By opening some frequencies in the two and/or six meter bands, this breakthrough might be brought about . . . and again amateurs will have contributed to the communications art.

Perhaps you have an idea for some use to put the unused half of the two meter band?

ANOTHER REPEATER SERVICE

A note from W1RAP suggests that a special receiver be set up at repeater sites tuned to the aircraft emergency beacon channel of 121.5 MHz and that some system be added to the repeater so this channel can be monitored when a plane is reported missing.

This would seem like an extremely valuable service.

It might be worth while to have the output of the beacon receiver actuate a low level tone on the repeater which would tell all users immediately that a signal was coming in on the emergency channel, but would still permit the repeater to be used normally.

Such a service could have expedited the discovery of a recent crash just a couple miles from the WR1AAB repeater site. When a plane goes down every minute wasted can be critical in bringing help to the survivors. If we were back in the old days when experimentation and innovation were encouraged by the FCC, I'm sure that many repeater groups would go far

beyond a mere warning system and probably evolve a system which would pinpoint the direction of the crash from the repeater. Two repeaters in one area could quickly provide the coordinates of a crash in this way.

Our repeater sites are ideally located for this service and, if we can get the Walkerules eliminated, our repeaters will be back on the air 24 hours a day, which would be important for an emergency aircraft warning detector system.

If any repeater group does set up a warning system, please be kind enough to let 73 Magazine know about it . . . and we'll in turn make sure that this news gets to congress, where it will do us some good. 73 is your *only* channel to congress.

JOB OP

Catch-22 in the publishing biz is that you have to have experience to get a job – so how do you get the experience so you can get a job? This is a tough one for publishing is a high pay biz and worth the effort.

One way to get on this gravy train is to find a small remote publisher and hire on for peanuts to get your experience. If you make the most of the opportunity you can come out of it with a salary well up in five figures – and that's nice. The big magazines desperately need people who really know the biz and can produce results. Ad salesmen can name their own price. Circulation managers do well too, etc.

Which brings us to some openings in the 73 staff for people to learn ad sales, circulation, layout and pasteup, assistant publishing, and things like that. The growth of 73 plus the work required on the new magazine that is being started in a couple of months means that more people are needed.

And where better to work than New Hampshire? It's fantastic.

Call Yvette WA8ULU at 603-924-3873 if you think you might like to give it a try.

WHY YOU GET CALLED

What to do when the FCC calls you up for re-exam

The FCC has been calling up Techs and Conditionals in fair quantities all around the country. This appears to be another move by Walker to harass the troops and implement punishment licensing.

When the letter arrives you have 30 days to get yourself ready for the confrontation. With a little work you can be ready for them, so don't despair and just give up without even trying. It just isn't all that difficult.

First of all you'll want to be sure that you can breeze through that code exam . . . and that's the one that throws the highest percentage of applicants. If you are able to copy the 73 Magazine six words per minute cassette code practice tape, the Back Breaker – 6 (BB-6), you'll have no problem at all with the 5 WPM stuff. At $3.95, this is a must. Conditionals will want to get the BB-14.

One beauty of these cassette code tapes is that you can practice during time that might otherwise just be wasted such as while you are driving to and from work, at lunch or even coffee-break . If you have any wasted time . . . in line . . . in waiting rooms . . . buses . . . planes . . . trains . . . or a dull job with time to spare, your little cassette tape player will be worth its weight to you.

Now there is the matter of the written exam. It doesn't do you any good to breeze through the code if you are going to make a mess of the theory. You should know by now, hopefully, that 73 Magazine has a series of four license study guides available, one for Novice, one for General, one for Advanced and one for Extra Class license exams. There are the only books available which cover all of the material you'll need to know. They are the only books that are up to date. The fact is that the FCC has recently rewritten their exams and this has made most study courses completely obsolete . . . except the 73 series . . . and the reason for this is that these are the very books used by the FCC to prepare the new questions!

The 73 study courses are different . . . they teach you the theory logically and systematically rather than just expecting you to memorize questions and answers. Q&A books are ok as long as you get the same Q's . . . which you probably won't.

The investment of $6 for the General Class study course and $4 for the code cassette are little enough for the peace of mind they give. If you give these two aids a chance there is no way you can fail that exam. And, at $9 a throw, it is worth a bit of an investment to make sure that you get through the first time. Who wants the embarrassment of flunking out? It makes it look as though you cheated when you took the mail order exam . . . so be prepared.

It might be prudent to order your book and cassette course right now rather than waiting for the axe to fall. If you wait, you could have only 30 days to get ready and you'll be nervously waiting for the post office to get your stuff from 73 Magazine to you, which could take a couple of weeks, the way things have been going . . . leaving you precious little time to get ready for the beady eye'd FCC examiner.

The amount of time it takes to be sure of passing the exam is so slight compared to the years of fun you can have with amateur radio that it is very well spent. A few hours of study and code practice can pave the way for a lifetime of fun. So make the study as easy as you can for yourself with the 73 study guides and cassette code courses.

73 IN THE QSL BIZ

After looking over the QSL price lists and doing a lot of close figuring, it was decided that 73 might be able to pull out really nice first class QSL cards for a lot less than they are available from most printers. Of course 73 has the advantage of having the latest in typesetting equipment, a professional phototypositor, an art department, a complete darkroom set-up, and an in-house printing department.

Three cards were designed and the first ad for them ran in the October issue of 73 on the back cover. The response was immediate and heartening. Hundreds upon hundreds of orders came pouring in.

The extremely expensive and very difficult to find heavy weight Chromecoat paper had been ordered before the ad came out, but with paper in short supply the delivery kept being put off, week by week. Eventually the truck pulled up with the big box of paper. The excitement was short lived when it was discovered that one end of the box had been broken in shipment and much of the paper ruined by water. Back it went.

A replacement box of paper eventually arrived and the team got to work catching up with the QSL orders. By this time the art department was deeply involved with getting the December issue ready for publication, so another week went by before they could get cracking.

Once December was done they got the artwork ready for the cards. First came the picture of the world in blue. Since ten cards were going to be ganged up on the press to keep the cost low this meant making ten negatives of the world and putting them in place for the blue printing plate. Biff Mahoney, the head of the printing department, ran off the blue printing, then the QSO information data on the back of the cards. This info was set on the composer, pasted up by an artist, and shot into ten negatives on the big process camera, stripped into the final position, and the printing plate made by a photo process.

The call letters for each card were set with a photo typositor and pasted into place on a large dummy sheet so they would appear exactly in the right place on the ten cards later on. Then

Caveat Emptor?

Price — $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

ACTIVE HAMS — monthly mailer of reconditioned and new equipment specials. Sell — buy — trade. Write: Associated Radio, 8012 Conser, Overland Park, Kansas 66204. Call: 913-381-5901.

FREE BOOK About Digital Logic and Computers, and how you can design and build your own. EEW, Box 8204-CC, Pittsburgh PA 15217.

"DON AND BOB" discount prices plus full warranty. Call or write fast quotes. All items new, guaranteed. SBE144 199.95; Midland 13500 2MFM 15W mobile 219.95; 13509 W-T 2W. 209.95; SBE450TRC, converts 2M-3/4M 149.00; 20% plus off list: Hygain TH6DXX 143.00; Mosley Classic33 124.00; Ham-M 99.00; TR44 59.95; Belden 8wire rotor cable 8448 10¢/ft; Hygain 400 rotor (230.00L) 179.00; 5cond. rotor cable 19¢/ft; 15% off list Triex, Rohn tower; 3/16" cable clamps 18¢ ea; No.15 antenna wire 1.95/C; Motorola HEP 170 epoxy diode 2.5A/1000PIV 29¢, 25.00/100 lot; .001MFD/10KV doorknob (CDE) 1.95; Hammarlund HF50 1.95; Motorola semiconductor data series 7.50; Sorensen ACR2000VA AC regulator 150.00; write quote Swan, Eimac, Drake, Kenwood, Tentec; Calrad KW SWR-relative power dualmeter bridge, to 150MHZ 15.95; all items guaranteed. Free flyer. Prices fob Houston, include postage with small orders, excess refunded. Madison Electronics, 1508 McKinney, Houston, Texas 77002. 713/2242668 nite/weekend 713/4975683.

COMPLETE STATION: First $350 takes Heath SB-101 with Xtal Filter, AC Power Supply, SB-600 Speaker, SB-640 LMO, Astatic 10-D P-T-Talk Mike. Hustler Antenna with 80 Mtr. Coil. WA2MQI — Glenn Commons, 12 Yorktowne Court, Princeton-Junction, N.J. 08550.

EQUIPMENT FROM 73

The following list of gear, unless otherwise noted, consists of brand new equipment purchased for testing purposes only. Some have been tested, some remain unopened in original cartons. We are offering this gear at a considerable discount on a first-come-first-served basis. Please send Money Orders or Certified Checks only to 73 Magazine, Peterborough NH 03458.

Cap Com 40M solid state SSB xcvr	$150.00
Gladding 12V power supply	$60.00
SBE Scanavision	$650.00
Midland 13500 2M xcvr	$200.00
Midland 13509 220 xcvr	$200.00
Tempo CL-220 220 xcvr	$200.00
Clegg FM-21 220 scvr	$255.00
TME-H-LMU 16 channel rcvr	$255.00
Digital logic-clocks	$80.00
Dycom 2M repeater	$425.00
Wilson 7 element 10 and 15M beam pick up only	$250.00
Waller 60A power supply	$105.00
Robot Monitor	$265.00
Robot Camera	$265.00
Pickering KB-1 keyobard	$200.00
TPL 502-B 2M amp 1W/40W	$110.00
TPL-5022M amp 10W/45W	$90.00
Heath HWA-202-1	$30.00
Heath HA-2022 amplifier	$70.00
Gladding 8 channel scanner	$110.00
Gladding HI Scan	$150.00
Regency TMR-8-U Scanner	$140.00
Tempo fmh charger	$25.00
Heath FM-2102 wattmeter	$30.00
GTX-2 FM rcvr	$225.00
Newsome 2M KW amplifier	$350.00
Heath IC-2009 calculator	$90.00
SBE 450 FM xcvr	$340.00
Mits calculator with ac adaptor and case	$130.00
Memory Matic 8000	$320.00
IC-30	$450.00
IC-60	$400.00
RP Synthesizer MFA 22	$225.00

HEATHKIT SB-102, CW filter, AC and DC suppplies, mobile mount, remote LMO, speaker, manual, asking $475. Heathkit SB-110, AC supply, speaker, manual, $225. Also Hallicrafters HA-1 keyer, $50.•All good condition. John Boston WB4RUA, Box 354, Calhoun, Georgia 30701. (404) 629-3048.

WE BUY— late model Collins-Drake-Swan. Top prices cash. Associated Radio, 8012 Conser, Overland Park, Kansas 66201. Call: 913-381-5901.

GOOD NEWS — The SRRC Hamfest June 2, 1974 at fabulous new site in Princeton, Illinois Fairgrounds. SRRC/W9MKS, RFD No.1, Box 171, Oglesby, Illinois 61348.

FOR SALE — Pearce-Simpson Gladding 25 Fully equip with crystal's for $189.00. G. Smith, 340 Granville, Bellwood, Il. 60104.

HALLICRAFTER, HT-33A, 1KW Amp. $225. SX-101A with Product Det. (Factory Sch.), $175. Both mint, with manuals. W1JSS. 617-762-5252.

GREATEST of them all! That's the ARRL 1974 National Convention, sponsored by Hudson Amateur Radio Council. Remember the dates — July 19, 20, 21 at the Waldorf-Astoria, New York City. Three days of exciting events!! Wide array of demonstrations, exhibits and forums featuring latest in FM, SSTV, ATV, RTTY, FAX, Satellites, Antenna design, Transistors, Integrated Circuits, DX, MARS, ARPSC and much more. Something to do every exciting minute for YLs & XYLs — Tours, New York sightseeing, visits to popular TV shows, Parties, Fashion Shows. Meet the ARRL President, Vice-presidents, and all 16 Directors! Famous-name Speakers at Saturday Night Banquet! Everything for the Non-Ham, New Ham and Old Timer. For Info, Contact: ARRL Convention, 303 Tenafly Road, Englewood, N.J. 07631.

SB-34 SIDEBAND TRANSCEIVER 75-15m, built in AC/DC supplies plus never used mobile mount. Total operating time on rig near 20 hrs., almost brand new! Sorry, no microphone. $225. Ron Subka WA9FPP/1, Russell Station Rd., Francestown NH 03043.

HAMMARLUND SP-600 "Super-Pro" 0.54—54.0 MHz $260. AN/FRR-59 Digitally-Tuned Receiver 2—32 MHz $700. Free delivery within 75 miles. Alan Frisbie, 381 Prospect, Cambridge, MA 02139. 617-547-7652.

CALCULATOR OWNERS: Use your +-x÷ calculator to compute square roots, trigonometric functions, logarithms, exponentials, and more! Quickly, Accurately, Easily! Send today for the improved and expanded edition of the first and best calculator manual — sold throughout the world . . . only $2.00. Absolutely unconditional money-back guarantee — and fast service! Mallman Optics and Electronics, Dept; -E1, 836 South 113, West Allis, Wisconsin 53214.

WANTED: Motorola S-1056/57/58 or 59 test set. Also, G.E. test set or adaptor to use Motorola test set on G.E. units. N. Swan RR2, Ludington, Michigan 49431.

PACE SCANNING RECEIVER Model 216 with 94 crystal, $110. Anthony Parker, 65 Belvidere Ave., Holyoke MA 01040.

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FREE with the purchase of a new Genave GTX-200 at $259.95: 18 crystals of your choice. Send cashier's check or money order for same-day shipment. For equally good deals on Drake, Standard, Clegg, Regency, Hallicrafters, Tempo, Kenwood, Midland, Ten-Tec, Galaxy, Hy-Gain, Cush-Craft, Mosley, Sony, and Hustler, write to Hoosier Electronics, your ham headquarters in the heart of the Midwest. Become one of our many happy and satisfied customers. Write or call today for our low quote and try our individual, personal service. Hoosier Electronics, Inc., R.R. 25, Box 403, Terre Haute, Indiana 47802. (21)-894-2397.

SP600-JX, rack mounting, manual – $250. HT20 AM-CW Transmitter – $50. H13BAC, manual, 34/94, dry batteries – $60. WB2YSR/3, Novas, 422 Cherokee St., Bethlehem, Pa. 18015

DAYTON HAMVENTION expands to three days April 26, 27, 28, 1974 at HARA ARENA and Exhibition Center. Brochures mailed March 15th. Write for information if you have not attended the last two years. P.O. Box 44, Dayton, Ohio 45401.

SALE: Collins 75S-3 AM and CW filters. Matching speaker $350.00, SB-400 $175.00. All crystals best condition. Clarence WBØHDM, 1004 So. Garfield, Denver, CO. 80209.

EXPERIENCED RADIO COUNSELOR. 19 year old Extra Class pre-med student with experience as YMCA radio instructor desires position at camp during 1974 season. Sanford L. Silverberg WA3RJV, 9 Summer St., Bradford PA 16701.

VERY INTERESTING! Next 5 isues $1. "The Ham Trader", Sycamore, IL 60178. (Ask about our "HAM EQUIPMENT BUYERS GUIDE" covering Receivers, Transmitters, Transceivers, Amplifiers 1945–74. Indispensable!)

SELL: All issues of 73 Magazine. All offers considered. John Hill W4WXJ, 2885 Lyncrest Dr., Nashville, TN. 37214.

SELL: Touchcoder with memory, typewriter keyboard sends perfect code all speeds, neat. $145.00 postpaid, no trades. SASE for information. Stuber W8PJH, Amherst, Ohio 44001.

KLM and MADISON ELECTRONICS present the finest VHF-UHF antennas. 144–148 MHz 7EL to 16EL; 9EL 31.95; 14EL $5.95; 16EL 49.95; 420–450 MHz, 14EL 19.95; 27EL 41.95; Write for literature. Prices fob Houston, include postage with order, excess refunded. Madison Electronics, 1508 McKinney, Houston, Texas 77002. 713/2242668 Nite/weekend 713/4975683.

(More W2NSD/1)

the names and addresses were set on the composer and pasted into place. When ten cards were done a negative film was made of the whole sheet and this was used to make the printing plate.

The cards went through the press for the third time . . . blue for the world on the front . . . black for the QSO information on the back, and black for the call, name and QTH on the front. The result was fantastic – one of the most beautiful cards ever. They take quite a bit of time to do, even when everything is at hand and the art department isn't tied up with 73 for you have to wait one or two days after each run through the press to let the ink dry thoroughly so it won't smudge or offset onto the card next to it.

The last step is to cut the ten cards apart, package them . . . which is another whole big deal getting the little boxes for shipping them . . . you have to buy these by the thousands! At long last they are picked up by UPS or taken to the post office and away they go. You know the postage runs around a dollar on a bundle of 250 cards? Perhaps the $6 price tag is too low for 250 cards.

It is hoped that these low priced attractive cards will help get more ops back into QSLing . . . it's the considerate thing to do.

POPULAR 73 CODE COURSE

It looks like 73 has done it again! The letters of congratulation have been coming in from users of the new 73 Morse code cassette study course. Most readers report being able to learn the code with one playing of the 90 minute cassette, with but two or three errors during the entire time. Over and over the letters tell of trying other code courses and being discouraged.

One aspect that seems very popular is the lack of any need for reading anything. There is no complex book of instructions, no charts, nothing much to read at all, just a simple cassette which can be used anywhere at any time. The cassette gets right down to the business of teaching you the code with the simplest and fastest system yet devised . . . with no long windy explanations. Within five minutes you are starting to copy whole words right in your head.

The individual characters are sent on this cassette at about 12 words per minute, but the spacing between them brings the overall speed down to five words per minute. This is most helpful later on when you are going to 13 per for your mind is already used to the faster characters and all you have to do is get used to translating them a bit quicker. A letter sounds completely different sent at a five word per minute rate and at 13 per, so most amateurs have to relearn the whole code when they speed up, making it much more difficult to do . . . and discouraging many to the point of giving up.

The first mention of the cassette in the October issue of 73 was in a brief paragraph in the editorial and, since almost all readers of 73 are already licensed, not much was expected of the whole business. Again the pulling power of 73 was not properly reckoned with for the orders for the cassettes came rushing in and the scramble was on to get tape cassettes, borrow tape recorders, and work around the clock to turn out the code courses.

Eventually we will have a professional tape duplicator that will knock off these 90-minute tapes in about 11 minutes, recording both tracks simultaneously. We'll no doubt be able to do better at buying blank tape than the local department store.

THE BACK BREAKER

While the 90 minute course does give good practice, the largest part of it is sent at 5 words per minute and in plain text. It was felt that a person really should be able to copy at six words per minute and copy five character groups comfortably before taking the FCC exam. This margin for error would help to take care of the nervousness factor that shoots so many on their first test. When you can copy six words per minute of mixed groups of letters, numbers and punctuation, then you are ready . . . really ready.

Thus was born the BB-6 cassette – the Back Breaker six words per minute study cassette. While you should spend some time copying this code on paper, the fact is that you can get your speed up very well by just copying in your head while you are driving, eating lunch, or pretending to work (with an earphone).

Both the basic code course and the BB-6 sell for $3.95 postpaid. A few readers have written in asking why the low price when most cassettes of this

length sell at about double that price. The answer is simple... we want more hams. If we are unable to get tape at some better prices the price may have to go up a bit, but we'll hold it as long as we can.

13 PER

The hardest text in amateur radio is the General code test where you are required to copy 13 words per minute. There are two reasons why this is such a chore. Firstly there is a hump at around ten words per minute which requires you to change from translating the dits and dahs to an automatic recognition system where you "know" what the character is without thinking about it. Once you have to think you have lost the ball.

The second factor which trips up amateurs on this test is the terror factor. The Novice or Technician five word per minute test is usually administered by a friend or local amateur and the pressure is low. The 13 per is laid on you by a steely eyed FCC examiner and panic is oftensthe rule, shutting down what little brain power you might have brought to help you think. Thus, if the code is not entirely automatic by this time, there is no way that you will be able to get your frozen brain to translate even a simple dit for you.

To help with this problem we have devised a very nasty 14 words per minute cassette with five character groups so you'll have no way of memorizing the material no matter how often you use or re-use the tape. This is brutal at first for the 6 word per minute translator, but persistence will always win out and eventually you will be breezing along with this cassette.

The FCC exam will sound slow to you after you have mastered this cassette. It will sound so slow that you'll be writing us, as so many others have, saying that the confidence you got with the first slow words of the exam made the whole thing easy and even took most of the pressure off the written part.

This cassette also sells for $3.95.

20 PER?

We're working on it.

KOHOUTEK NET

Comet watchers throughout the solar system will be celebrating the visit of Kohoutek and W2IKQ sees no reason why radio amateurs should be trailing behind. Clubs setting up amateur radio exhibits at Kohoutek events are invited to join together on 14300 kHz or 3900 kHz at 0000z.

West Thomas W2IKQ publishes a newsletter called SynergyAccess, modestly subtitled, "A global newsletter of futuristic communications, media and networking." In view of the incredibly poor record man has chalked up in the past trying to foretell the future, the synergists have their hands full.

GETTING DATA

Reading and research is getting more and more difficult as the supply of information expands. More and more firms are in the business of supplying information, some of it of value, some hyped up to make you think it will be of value. It is getting difficult to even find out where to get the information you want.

Some breakthrough should turn up to ease this problem. Perhaps it will be a combination computer terminal video display unit with a sort of video tape attachment. This would permit you to access the "library" computer and start with the index. If you've ever used the Library of Congress you perhaps can appreciate the dimensions of just an index... it fills a huge room... or at least it did the last time I used it back in 1933. That's just the general reference index, other more specialized indexes are in other rooms.

There comes the question of whether this will eliminate the book industry, or perhaps just do away with hardbound books. If you read much at all the storage problem becomes serious. I read about 50 pounds of books and magazines a month... now consider the cost there in paper, printing, postage to bring it here, and the room it takes for storage.

TAPES WANTED

We're still wanting tapes of any ARRL directors who speak at clubs or conventions... as well as FCC officials. We'll copy your cassette and get it right back to you in the next mail.

CB OF VALUE?

An article in the Philly Enquirer sent in by WB2QQQ points out an application for CB that is spreading in use. Truckers are using CB now to warn each other of police cars and radar traps. This application may spread in use rapidly as more truckers and even plain old drivers are clued in to the "service."

The trucker channel may come alive as someone says, "Smokey the Bear is near Exit 15. He's in a plain wrapper, so watch out you don't get green stamps." This obviously translates to police in an unmarked car ready to give out tickets. This is how trucks can zip along at 70 mph and never seem to be caught by the troopers.

Needless to say the truckers refuse to identify themselves when operating and there is little doubt that virtually all of them are unlicensed. So who needs a license to run an unidentified transmitter?

Should the 220 CB band open, this would be even more beneficial for this type of communications, for then the truckers wouldn't even have to contend with Big Red and his five gallon signal on their channel from time to time.

Of course it is possible that the police will eventually mount a counter radio move, with their own illegal CB stations broadcasting bum dope to entrap the truckers. Say, can a branch of government operate illegal transmitters like that?

HAMFEST HINTS

A hamfest has to have several important attractions in order to bring in the brethren. Unfortunately, many hamfest committees give some of these aspects short shrift – and another lead balloon is launched.

The exhibitors are not the beginning and end of a hamfest, but the fact must be faced that without 'em you ain't got a hamfest. So how do you get exhibitors to come? If you convince them that you will have several thousand live amateurs in attendance they will come. The greater number of amateurs you draw, the further they will come from.

You have to start early with manufacturers and distributors for their available dates fill up fast. Well-established hamfests start a year ahead with their PR and booth solicitations. The charge for a booth is ticklish for if you set it high it will keep the smaller firms out – and if you set it low you may not have enough money for everything. I would suggest a fee on the order of perhaps $35 per one thousand of licensed amateurs honestly expected to attend for each ten foot by eight foot deep booth. Your booths will include tables and chairs, with tablecloths, plus back and side drapes.

Be sure that you have a shipping address for booth material and free storage too. Be prepared to help deliver this stuff to the booths, and it is a good plus to have a couple (or more) Novices on hand to help put some of the bigger booths together. Remember to have some youngsters (gals are great for this) as gophers – to go for cube taps – tape – wire cutters – string – all that stuff that should have been remembered, but wasn't. They can help get up antennas for portable repeaters, demonstration rigs, etc.

Remember too to help exhibitors with their hotel reservations – can you get them a special hamfest

rate? – maps showing how to find the hotel and hamfest area – anything like that which might be helpful. Be sure to have nice signs made up early so exhibitors will know where to set up. Don't forget power for those that need it.

Your gophers can also be on tap to spell exhibitors so they will have a chance to get around and visit some of the other exhibitors – get out to lunch – or go potty. Be sure that some willing workers are not taken advantage of – more than one exhibitor has been known to set up a booth and then walk away from it for hours – which is lousy for the hamfest and murder on a gopher. You might set a time limit for such sitting services.

Enough on the exhibitors – you must have attendees too, or your exhibitors will go away and and never come back. Is there a big mystery on how to get thousands of amateurs to come to a hamfest?

In the olden days you needed lots of prizes. They will help, but they are not the drawing card they once were. Large numbers of smaller prizes seem to be better than a few expensive ones, by the way. Someone who has paid $4 entry fee for your hamfest will be happy if he walks away with a $7 subscription – a $9 Callbook – a soldering iron – five pounds of solder – a spare speaker – a small IC kit – stuff like that. They've got their money back! You can give 200–300 hams their money back for the price of one rig . . . and you'll have 200–300 more hams talking you up the next year.

Today, with the increased interest in specialized aspects of the hobby, your program is one of your most valuable assets – and can be the apple that spoils the barrel for you if you neglect it. Remember that you have avid FMers – repeater nuts (they put up the repeaters the FMers use) – DXers – 160m fans – X-CARS nets – certificate hunters – RACES – Mars – slow scanners – RTTYers – VHFers – satelliters – mobilers – and others. Get the best speakers you can for your forums and make sure that PR gets to each group involved. Your RTTY speaker or panel should be hyped in the RTTY magazines – and in the RTTY columns of the regular ham magazines. Ditto slow scan – DX – etc.

A celebrity won't hurt any. Barry Goldwater will bring 'em in by the hundreds. You have to plan a year ahead to get the FCC to pay for one of thei; men to show – and that is the only way they will play ball – but you might end up with the Chief of the Amateur Division – whoever that is at the time. You might even get an FCC Commissioner.

Unfortunately there are not very many proven speakers once you've been turned down by Barry.

Try to deploy your best speakers at your best times. Few speakers make much of a dent when the audience is hot and sweating – or sitting back after a banquet quietly urping – or at the end of a hectic hamfest day. These are better times for lesser lights talking about their specialites.

To have a good turnout for your hamfest you will have to get every one of the local hams you can to be there – plus as many as you can cram in from afar. FMers will fly across the country for a good FM program – and so will the other really hot branches of the hobby. DXers will come in from foreign countries – so will slow scanners if you have the program and get the word around.

Those locals – how do you get them off dead (right word) center? You do not leave it to chance. You put up posters in radio stores – you organize members of every club in the area to canvass all bands for a couple of months before the hamfest to personally invite everyone they hear to come – particularly on the shorter range bands. You organize a phone call canvass of all local hams. You might even arrange to try for the ARRL membership list for your area and send them brochures.

You'll want ads in the ham magazines. For the most part you can bargain with them for booth vs ad space – but you may want to use one or two (one is enough) to reach the really active hams with continuing ads. This is not all that expensive if you use 73 (plug).

When setting up your hamfest area keep security in mind. Exhibitors should be able to leave their booths wide open overnight if your event runs two days – or if they set up the night before. If you have a flea market be sure that it is separate from the exhibit area so fellows won't be carrying rigs around to confuse your guards. You'll have to accept hand units – they'll be everywhere. Make sure that those opaque bags are not permitted as they help encourage youngsters to flip stuff into the bag when no one is looking. Pilferage has risen tremendously at a few of the recent hamfests as a result of these opaque bags. You'll also want to be sure that everyone in the hamfest area has a ticket.

When planning your finances you should aim at bringing in a reasonable profit for this money will be very handy for getting the event going next year. With some money in the bank you can invest in prizes, ads, brochures, direct mail, etc.

If you get plenty of exhibitors and plenty of attendance you'll have a going hamfest. It does take work and coordination, but it isn't difficult, just exhausting.

DESTROYING OUR CHILDREN?

Saturday morning is a great time to get on the air and work some DX – rag chew – and generally ham it up. But what are your children doing while you're on the air having a ball? Chances are, unless you have TVI, that they're in the other room being stupified by Saturday morning television. In between contacts, just mosey in and see what kind of stuff is being fed into their minds by the bushel.

You'll probably find them staring intently at Dr. Doolittle – now what could be less harmful than that? The good doctor and his animals face various bad guys and win out. Take a look at the bad guys that are threatening him – Italians, Turks, Spaniards, and ethnic types – every one of them. And all with odd accents to boot. The heros, needless to say, are clean cut WASPs with excellent speech.

It is tough enough for us older generations to cope with the concept of equality after a lifetime of propaganda – we hardly need to have these biases passed on to our children. The cartoons are written and executed by older people who are so used to these biases that it probably never occurs to them that they are biases.

Your daughters are being fed large doses of old fashioned female stereotypes via these same programs. Have you ever wondered why the sound of a female voice is so rare on the air? Is this due to some genetic difference between women and men or is it merely a matter of training? (I used the word "merely" just to see if I could get it by you without your noticing – there is nothing mere about the constant propaganda girls get to convince them to stick to the motherhood–doll–housecleaning–cooking role. This means that girls can't understand anything technical or complicated and have to turn to us strong and smarter men for help when the light bulb needs changing.

But we do have a few female hams, so perhaps it is possible for a woman now and then to escape the clutches of this omnipresent conditioning. In fact the Callbook indicates that some 11,000 YL's are licensed – and that is about 4% of our total ham population. It appears that most of these are the inactive wives of hams and for some odd reason they went to the trouble to get their tickets – or were given them via the Tech route. Most

of the licensed YL's I know fit in this category. You hear darned few of them on the air – certainly a lot less than 1%.

GLOOM OF NIGHT DEPARTMENT

One part of the publishing biz is getting a daily bundle of complaints from subscribers about late copies. Apparently only a small percentage of my fellow Americans are even remotely aware of how bad the mail service – and there is nice pair of words – about as much of a contradiction of terms as "army intelligence" – has gotten. The twice daily delivery of two cent letters is past.

Naturally my mind turns away from frustrations with the FCC and ARRL to thoughts of how to get the damned mail system back into working order. Simpler problems like this are perhaps a way for me to avoid larger problems.

Two tacks suggest themselves. One is a standardization of mail system which would permit almost total automatic sorting and handling of the stuff. The other approach has to do with the utter absurdity at this time in history of having to send a particular piece of paper physically from one place to another, using the paper simply as a media of carriage. That aspect of the mail hasn't changed in centuries – eons.

Well, it hasn't changed much. I suspect that one part of the problem is that the startings of change got intrenched and never developed much. The Teletype machine – which grew to popularity in the early 20's, has changed very little since then. Pity, for the basics for a big change were inherent in the concept.

Perhaps we'd do well to put aside all of the present communications systems and take a look first at what we want to do – then at how it could be done.

Since about 90% of the mail today is business correspondence, let's take a look at the parameters involved in this type of communications. A relatively small percentage of this starts out as dictated letters which are transcribed by a secretary or steno and then mailed. Most of it tends to be invoices, acknowledgements, statements and other forms. Routine correspondence like this would seem to be ideally suited to some new system – a fast system – a bulk handling system.

Any new system would have to cost less overall than the present mail system. This is hardly a restrictive parameter in view of the rising cost of sending letters – soon going to 10¢ each, it is rumored. Cost considerations do eliminate some complicated computer terminal solutions, satellite access, things like that. But perhaps there are machines in general use already – and services – which could be better utilized.

For instance it would seem reasonable to think in terms of using the telephone lines as part of the "mail" system. They reach into every home and business in the country – and are getting into same in many other countries. These lines are used only a very small percentage of the time – which means that we could use them for a lot more than they are presently being used in the name of efficiency if for no other reason. Actually, using common techniques, it would not even be necessary to interrupt the telephone use of the lines to use them for many more applications.

One other piece of major electronic equipment is already in every home – the television set. And the bulk manufacture of this item has brought the price down to remarkably low levels. It might be worth while to think in terms of some sort of "mail" system which used telephone lines and a television set as a terminal monitor.

Starting with that combination I am certain that any number of engineers will be able to devise relatively inexpensive terminal units which will do the rest. There are new ideas on what types of encoding are best for sending the most written words per unit of time per bandwidth. Probably digitalized. A small keyboard, perhaps like some of the touchtone pads we are using on hand units, might do for writing the messages. Tape cassettes would do for temporary or permanent memory of messages. The message would then be displayed on your TV set as you type it and, when all done, could be fed into the phone wires.

Local phone offices would automatically record the "mail" and sort it by zip code (or whatever) to area centers. It would probably be best to hold messages until several were ready for a particular regional destination. You can take it from there.

Scanners are now being built which optically scan typewritten material and convert it to any code you like for transmission. These would be more costly and probably of value to larger businesses.

Computer bookkeeping and inventory would be greatly simplified by such a fast and relatively automatic communications system. Company A could originate an order for material and send it. Within minutes the acknowledgement would be received. The shipping memo would tell them when the material was sent and how, with details on insurance, routing. The invoice would tie all this together. The packing slip from the received goods would finish the matter and trigger the notice of payment (used to be a check) – and this might be confirmed by an automatic statement of account from the shipper indicating that all is complete.

Using modern data transmission techniques the cost per transaction should be miniscule – perhaps 1/10th of the cost of using the post office system – and think of the time savings. This makes it possible to automate the entire system and have only problems alert live people. This further cuts costs – enormously. And by eliminating vast gobs of routine, it should make life a little better for all involved.

Amateur Opportunity

As far as I know, little work is being done on inventing a system such as proposed above. This would appear to be an area that might be open to the amateur. By amateur, I don't necessarily mean a radio amateur – just someone who is not professionally working in the industry.

Amateurs have a distinct advantage over professionals, as you are probably aware. Firstly they usually have less that they "know" to be so. This gives them a much greater flexibility. Most of the truly innovative inventions have been made by amateurs because they have this edge.

One other major advantage is that professionals are working for a profit-making concern. This means that unless a proposed invention has a 100% chance of being made and used, that funds will not be available for experimenting and development. Amateurs can afford to spend years working on ideas that have only a small chance of success.

Automatic Mail Handling

The post office has experimented with gadgets to read addresses and sort mail automatically. I understand that these were less than perfect and that not much more has been done along this line. I suspect that the main drawback was the post office attempt to adapt their machines to the vagaries of the public rather than trying to get the public to adapt to the postal machines.

By setting a slightly lower postal rate, the use of standardized envelopes and addressing could be encouraged. They could use any system they wanted – from punched tapes to magnetic print to typing. Whatever system is the most foolproof at present would be best. I suspect that a magnetic system such as is being used for bank checks might be easily adapted. The machines for addressing would quickly be available.

Magazines could be handled quickly and at a fraction of today's cost if they were standardized and automatic

sorting were used. Magazines are going to be with us for a long time to come, so we might as well start working on a less expensive and faster way to get them delivered.

If the post office started putting in sorting equipment and offered a penny saving per magazine every publisher would quickly change to the official magazine size and put in the addressing equipment.

Going back, for a moment, to that home television-telephone terminal – once you have that set up why not use it for ordering things you want to buy – food from the local market – stuff from Sear's – or even magazine subscriptions? There is much to be done along this line.

A VISITING DELEGATION

Your congressman will appreciate getting a visit from you. The most effective way to handle this is to arrange for three or four representatives to come to Washington from your group – no more than four. Call ahead and arrange for a meeting time – and be there on time without fail. Then, in not more than ten minutes, get your message across – and do it without emotional hassle. Make it a consistent message and leave the emotional aspects out. Make it articulate. Your congressman is intelligent and he will probably get bored if you start wandering from one point to another. End up your message with what action by your congressman will be of help to you. Let him know what he can do.

You might take about a minute or two to fill him in on what amateur radio has done and is doing – how every major communications system in use today was invented and pioneered by amateurs – and that amateurs are still in the vanguard of this, even though techniques are enormously complicated today. Amateurs invented present-day single sideband – narrow band FM – etc.

Then bring up your main problem – probably the repeater docket. Give some of the major difficulties and their impact on his constituents – and then what you would like him to do about it.

The fact is that you can have a profound effect on what is happening. You don't have to just sit there and frustrate because ARRL has no Washington lobby. You can be part of the amateur voice in Washington. Your congressman will help you, once he knows what you want him to do.

The impact on the FCC of a call or note from a congressman or senator is profound. The Commission knows where the money comes from – and they know that if they get complaints from congress that they had better do something about it. This might mean replacing Walker with someone who will be less restrictive in both regulations and interpretations of the regulations. This might mean backing down on repeater regulations and interpretations of the regulations. This might mean backing down on repeater complications and restrictions. This might even mean blocking the 224 MHz CB proposal.

Right now there is one voice being heard in Washington in support of amateur radio – and this is *yours*. Are you speaking loud enough to be heard?

Is FCC Rulemaking Procedure Outdated?

In the case of amateur radio, the ever accelerating technology would seem to have made it impossible for the rules to keep up with the current state of the art.

In one case after another we find that it takes not months, but many years for new rules to be formed – and then, after all of that work, we almost invariably have been finding that the rules are so far out of date by the time they are enacted that there is little need for them – or that they miss their mark by such a wide margin that they are more harmful than helpful – and the prospect of starting over again on a many year project to get them changed is discouraging.

Two meter FM repeaters sprang from a little known development to the largest single interest in amateur radio in a space of about three years. Some of the pioneers proposed rules to help repeaters grow way back in the beginning. By the time the rules came out the growth had already happened and the proposed rules were no longer appropriate.

It would seem that some basic change should be made in the rulemaking procedure – one that would make it possible for the rules to keep up better with the state of the amateur art – and one that would permit changes to be made as the need becomes apparent.

The amateur service is well known for its ability to self-monitor, perhaps it is time to consider some method whereby the service could also be self-regulating.

It has been proposed – and, indeed the FCC has indicated that it is considering, some sort of system whereby amateur clubs could take over the function of examining applicants for amateur licenses. This responsibility could help to give many clubs more of a purpose for existing and a focal point for their activities. It seems possible that such a function might encourage more clubs to set up training courses and programs to get more teenagers into the hobby.

If, in addition to the training and examining of new amateurs, clubs also could participate directly in the formation of new regulations, this might do even more to create a personal interest in the amateur service on the part of the average amateur.

Any number of legislative systems could be set up – a board of directors along the line of the ARRL – who could meet regularly (perhaps yearly) to do the bidding of their constituents – or perhaps a meeting similar to that held by the ITU where representatives would be present from each concerned radio club – with their expenses paid for by the clubs – where rule changes would be first put into committee and then reported to the body at large for passing or vetoing.

The committee system helps to preserve the interests of minorities – and since amateur radio is made up of a bunch of minorities, this might be a good system.

These are just some ideas – perhaps you have a suggestion that is worth consideration as to how to change the rulemaking procedure to help amateur radio grow more smoothly?

INFO?

Being up in the backwoods of New Ham Shire it is possible that we may have missed some new developments and readers may be able to send along some data that will help. Are there any relatively new addressing systems for office use? We have an Elliott system – and it does leave a lot to be desired. We've tried the Scriptomatic and have had to develop a high resistance to incredible frustration in its use.

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New QRP Idea

A letter from WA7UKP proposes an interesting idea. He observes that the Extra CW bands are pathetically empty – ditto the phone bands. . .so how about making use of these bands by permitting QRP operation in them by lower class operators – say five watts or even less? Maybe even one watt?

John J. Schultz W2EEY
1829 Cornelia Street
Brooklyn NY 11227

WIDE RANGE IC AUDIO OSCILLATOR

A 20 to 20,000 Hz oscillator using a single 741 op amp

Many radio amateurs still do not own a good, wide range audio oscillator so they can make realistic checks on audio circuits. That problem can be readily solved by constructing the unit described in this article. It may seem extradorinary that so much performance can be obtained from an inexpensive and simple to build unit but here are some of the main features of the unit:

1. A minimum range of 20 to 20,000 Hz in three switch selected ranges.
2. Harmonic distortion as low as 0.15%!
3. Single, inexpensive IC construction (a 741 op. amplifier).
4. Battery operation for complete portability.
5. Long battery life(only 6 mA drain from one or two 9V batteries).
6. Square wave output adapter (another simple IC).
7. Expanded scale readout in the speech range of interest to most experimenters (200 to 500 Hz and 2000 to 5000 Hz).

All of the features above, except for the square wave output, are provided by the circuit of Fig. 1.

The circuit is that of a Wein bridge oscillator using a 741 operational amplifier. Any of the various 741 packaged amplifiers may be used. The dual–in–line versions sell for about 50 cents and metal can version which the author used costs about $2.50. The op amp is internally frequency compensated and a minimum of external components are necessary to form the ocsillator circuit.

The components that are necessary for the Wein bridge circuit need not be expensive but they should be chosen with a bit of care. The dual potentiometer used for frequency control can be a type designed for stereo audio systems where the two pots track within 3 dB or less. The potentiometers must however, have a linear resistance taper if the frequency scale template described later is to be used. An Ohmite CCU2531 is

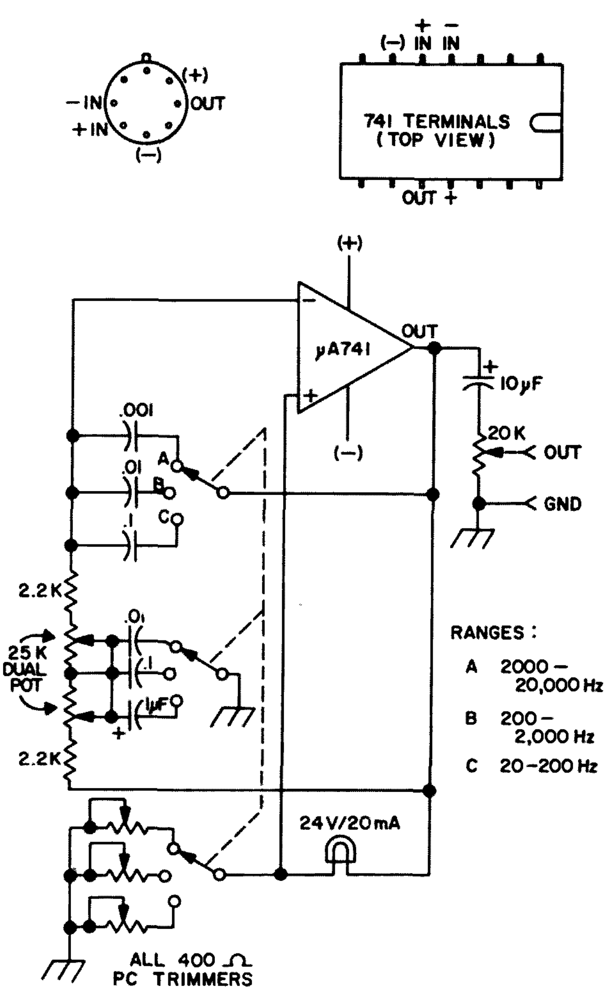

Fig. 1. Generator circuit. See Fig. 2 for power connections.

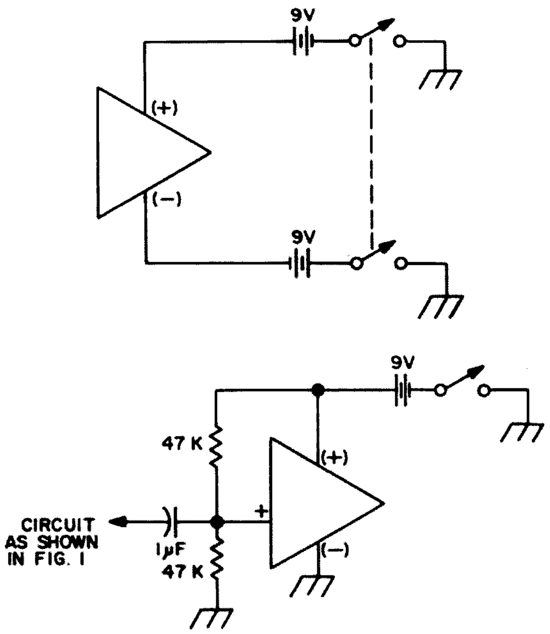

Fig. 2. Options for dual or single 9 volt battery supplies.

one example of such a type but many other types are usable as found in many ads for discounted price components. The capacitors used should be either of the Mylar (10% tolerance) or paper types. Disc ceramic types, because of their poor temperature stability, are not acceptable and are particularly to be avoided. It is not necessary but it would be advantageous to be able to measure the capacitors used and choose values as close as possible to those shown. The main advantage in doing this is that a minimum of readout shift will occur when one switches between ranges with the frequency pointer set at, for example, 200, 2000, or 20,000 Hz. The minature lamp used between the output of the 741 and one input stabilizes the output level. A 24V 20mA lamp seems to work particularly well but other types with voltage and current ratings down to 10V and/or 15 mA can also be used.

The above comments about the selection of parts may seem a bit tedious but all the parts necessary for the "heart" of the oscillator can be purchased for $5 or less! The rest of the cost for the oscillator is only dependent upon how elaborate a housing one wants to use and how fancy one wants to make the frequency readout scale.

There are two options available to power the oscillator. Either a single 9V battery can be used or two 9V batteries. Fig. 2 shows how the connections are made to the 741 for either option. When using a single 9V battery, it is necessary that a resistor and capacitor network be added to the 741 to bias one input to half the battery voltage. The advantage of the single 9V battery, besides battery cost, is that a SPST switch (which may be part of the range switch) is only necessary as an on/off switch. The disadvantage of the scheme is reduced maximum output (about 2V) and slightly increased distortion (about 1/2%). The author used two batteries although a DPST switch is then required as an on/off switch. With two batteries you cannot use a SPST switch in the ground return lead as an on/off switch. The still flowing unbalanced current of a few mA. will eventually drain the batteries.

There is nothing critical about construction. I constructed all of the circuitry on a small square of perforated board stock which was wired together with the range switch. This method compacted all the wiring in one location and the only other wiring was from this board to the dual 25 K pots, the batteries and the output level pontentiometer. Leads on the board should be kept short and can be centrally placed around the IC. A socket for the IC is suggested so one can apply enough heat to be sure joints are properly soldered without causing damage to the IC.

The simplest form of readout for the generator is a printed scale. Fig. 3 shows the template for the frequency readout scale which can be made in any size as long as the relative dimensions are maintained.

Using the parts suggested, the scale shown should provide accurate readout that is sufficient for most experimental purposes. A more accurate scale can be developed, of course, if one has access to a counter. Any large size knob with a 270° scale on its flange reading in relative units (0–100, for instance), can also be used if one doesn't mind referring to a logging scale to find the frequency being generated.

The adjustment of the three 400Ω trimmer potentiometers, one for each frequency range, can be done in several ways to

obtain the purest sine–wave output waveform. The simplest method is to listen to the output on an audio amplifier and adjust the potentiometers so the generator just starts to oscillate. There will be found to exist a point on the potentiometer where the oscillator just alternates between sustaining oscillation and having the oscillation slowly decay. Adjusting the oscillator in this manner carefully, one can achieve a harmonic distortion of less than 1–2%. Unless one is engaging in hi–fi work, this distoriton is probably acceptable for most work on communications circuits. One should make the adjustment at mid–frequency on each range and be sure oscillation continues at each end of the range. If one has an oscilloscope, a further refinement is possible by being able to see the point at which the oscillator just goes into the state of sustained oscillation. If one is really fortunate to have access to a distoriton bridge, the output can be adjusted to bring the harmonic distortion to 0.1–0.2%. The author tried the "listening only" audio distortion bridge. The distortion achieved was always less than 1%!

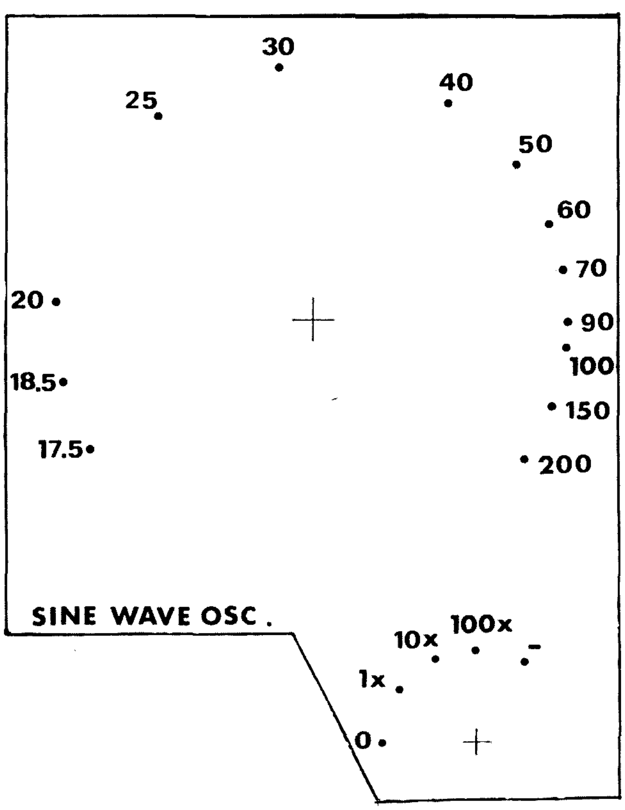

Fig. 3. Template for frequency scale achieved if components specified are used.

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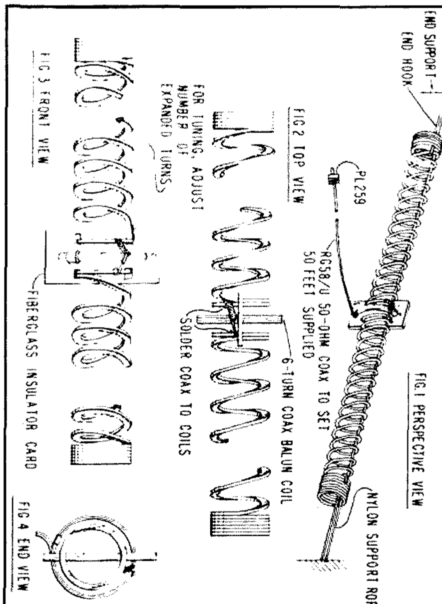

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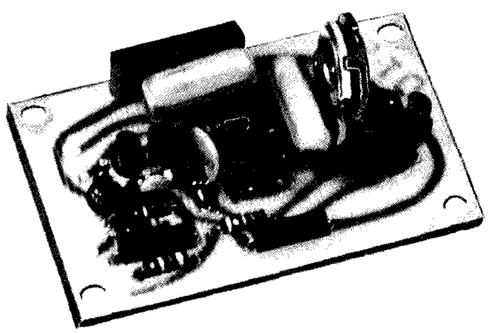

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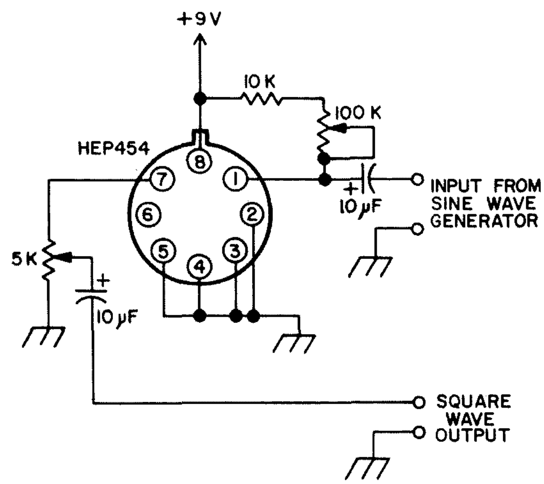

Fig. 4. Square wave converter accessory.

Battery life is quite long since in the two–battery powered version, the drain from each battery is only 6mA. Ordinary 9V transistor batteries are adequate and extra capacitance across the batteries to reduce their internal resistance was not found necessary. The output of the generator can be safely utilized in any position of the output level control. Because of the IC used, it is internally short–circuit protected.

For some work a square wave output may be desired. Although one can crudely connect a diode pair across the output to achieve a square wave, a proper sine to square wave converter, such as that shown in Fig. 4, is much more satisfactory. The HEP 581 is a 4 input NOR gate with output amplifier, although the latter is not used in the circuit. The input sine wave is applied to one gate while the other three gates are gounded. The 100 K pot can be adjusted for a symmetrical waveform using an oscilloscope or simply replaced by a 47K fixed resistor if symmetry is not important. The circuit produces excellent square wave outputs up to 30 kHz. When using the converter, the output from the sine wave generator should be set at maximum and the output regulated by the 5K pot in the Hep 581 circuit.

The instrument described will provide any amateur with a dependable means to measure the frequency response of any audio circuit, trouble–shoot modulators and other audio equipment.

. . .W2EEY

Richard W. Fergus W9DTW
2N570 Argyle Street
Lombard IL 60148

ANOTHER ID GENERATOR CIRCUIT

OFF-ON-OFF-ON-OFF-ON-OFF-ON
OFF-ON-OFF-ON-OFF-ON-OFF-ON
OFF-ON-OFF-ON-OFF-ON-OFF-ON
OFF-ON-OFF-ON-OFF-ON-OFF-ON
OFF-ON-OFF-ON-OFF-ON-OFF-ON
OFF-ON-OFF-ON-OFF-ON-OFF-ON
OFF-ON-OFF-ON-OFF-ON-OFF-ON
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OFF-ON-OFF-ON-OFF-ON-OFF-ON
OFF-ON-OFF-ON-OFF-ON-OFF-ON
OFF-ON-OFF-ON-OFF-ON-OFF-ON
OFF-ON-OFF-ON-OFF-ON-OFF-ON
OFF-ON-OFF-ON & ETC.

Many ID generator circuits have been published during the past few years. Each circuit usually had some advantage but few, if any, seemed to be both simple and easy to use. After some thought on the subject, I discovered a different approach which simplified the circuitry and made the programming very simple. Let me repeat the reasoning I went through to reach the final circuitry.

First, the signal we are trying to generate is nothing more than a series of OFF and ON conditions which have two different time durations. The ON condition can be of one time duration (dot) or of three time durations (dash). Likewise the OFF condition can be of one duration (space) or three durations (blank between characters). At first the different time duration requirements suggest counting a single frequency (pulse generator). After considering this you soon realize that many decoding steps will be necessary, e.g., a dash-blank would require six steps. This seemed to be a waste of circuitry so another approach was needed.

If we consider this OFF-ON signal coming from an oscillator which can be controlled to produce independent ON and OFF time durations, the decoding requirements will be reduced drastically. One counter step can be used for an OFF-ON code pair. Although this oscillator may be a little more complicated, the decoding reduction could more than offset for this additional circuitry. As will be shown, the additional circuitry to accomplish this generator function is minimal.

The next problem is to derive the signals necessary to control this oscillator. Obviously we need to count the OFF-ON code pairs and provide some means of feedback to the oscillator. Again, the first thought tends to follow the conventional means of decoding each step of the counter which gives us a separate signal for each step. The only trouble is that we need more than one type of signal for each step. Since both the OFF and ON signals are part of one step, a separate control of each is necessary. Actually, each step can have four possible combinations: space-dot, space-dash, blank-dot and blank-dash. There is an easy answer to this apparently complicated problem.

A multiplexer can provide the function we need. A multiplexer is the opposite of a decoder. While the decoder provides a sepa-

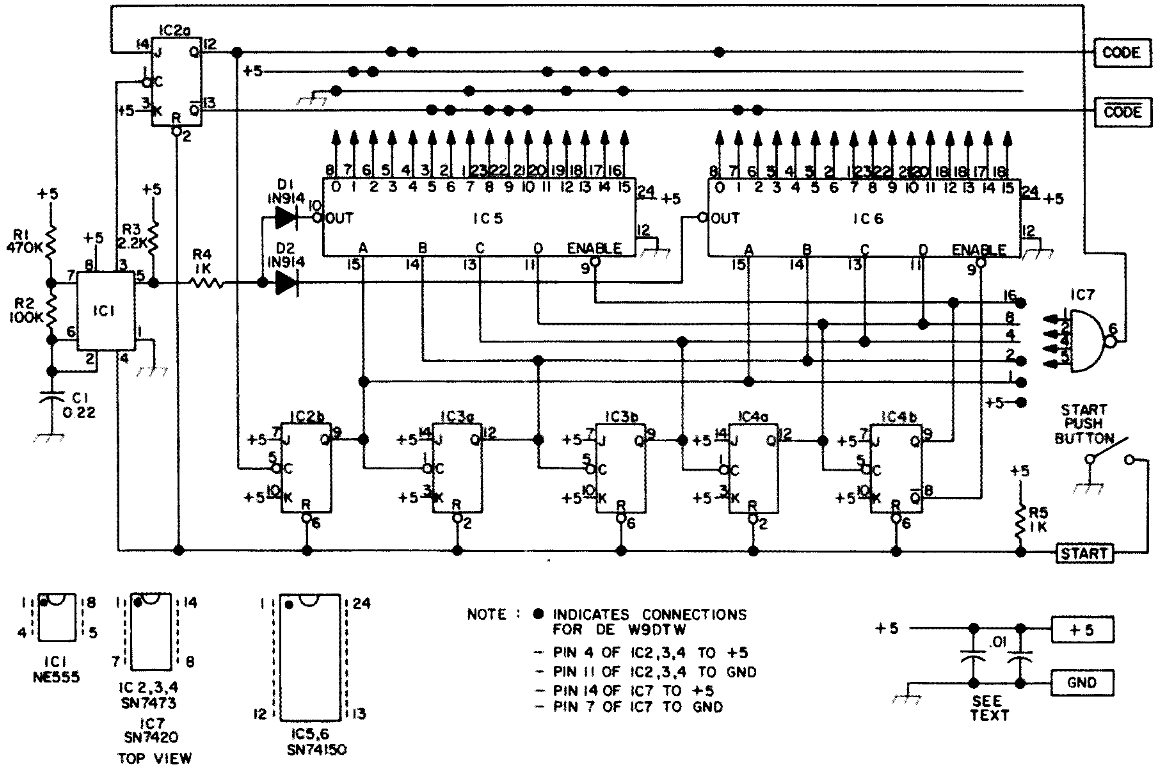

Fig. 1. Schematic of the IC identifier. Connections for the program "DE W9DTW" are shown at the top.

rate output for each counter step, the multiplexer selects one of a multiple inputs and switches it to a single output. Now all that is necessary is to tie each multiplexer input to a signal which will control the oscillator for the designated step.

We still have four possible step combinations to generate but before we complete this part of the design, we should return to the oscillator. The oscillator consists of two parts: a pulse generator and flip-flop. The necessary feature is that the pulse generator pulse period can be changed independently of the flip-flop state. If the pulse period is shortened while the flip-flop is in the OFF condition, a space is generated instead of the longer blank. Similarly, if the pulse period is shortened while the flip-flop is in the ON condition, a dot is generated instead of a longer dash. So, if we provide a signal to the pulse generator during the ON condition only, the ON condition is modified, or if we provide a signal during the OFF condition, only the OFF timing is modified.

Now we should be getting a clue as to what signal is needed at the multiplexer input for each step. If we assume that a HIGH logic signal will decrease the pulse duration or speed up the flip-flop action, the signal into the multiplexer should be HIGH when we want a shorter duration (either ON or OFF). If a continuous LOW is applied, the oscillator output will be a blank-dash series. If we want a long OFF output but a short ON output (blank-dot) for a particular step, we can connect the appropriate multiplexer input to the oscillator output. Now when the output is OFF, the pulse generator has a long duration but as soon as the oscillator switches to ON, the pulse generator will speed up. If we want the opposite cycle (space-dash), the inverted oscillator output is connected to the multiplexer input. If a continuous HIGH signal is connected to a multiplexer input, both parts of the step will be shortened and a space-dot will be generated. Therefore, each multiplexer input must be connected to one of four signals: LOW (ground), HIGH (power supply), output (CODE), or the inverted output (CODE). Since these connections are multiplexer inputs, no diodes are required . . . only wire jumpers.

The schematic illustrates the circuitry that performs the described functions. The oscillator is composed of IC1 and IC2a. A

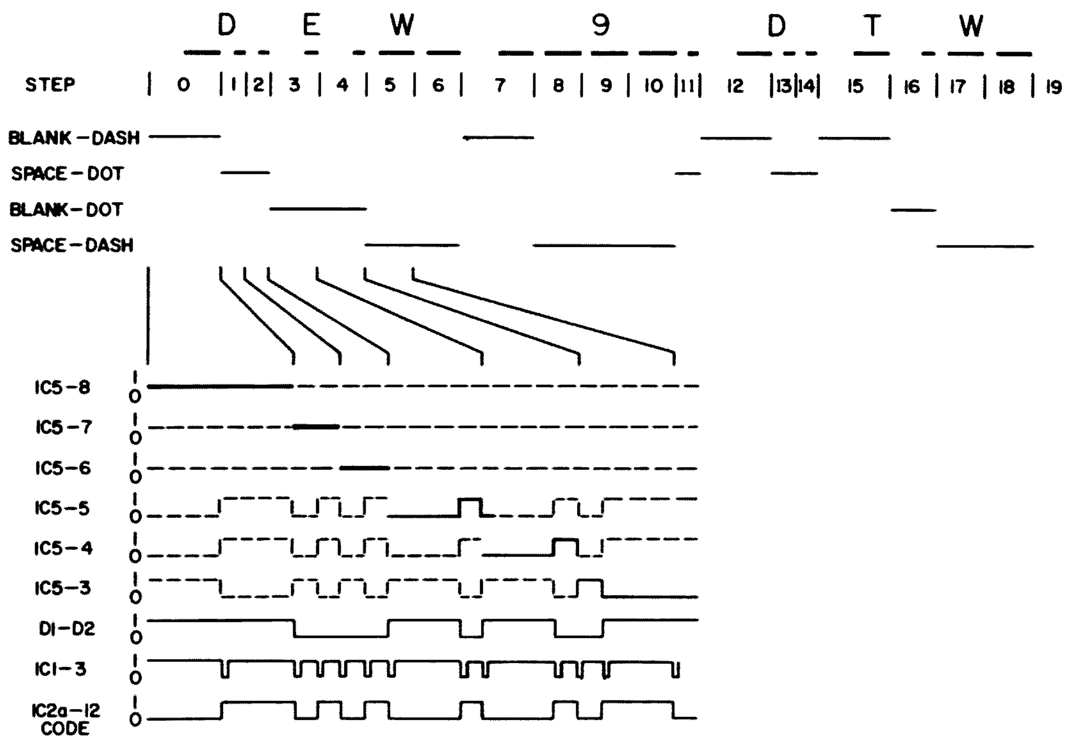

Fig. 2. An example of the waveforms at each IC during the beginning of the indicated program.

free-running oscillator (NE555 timer-IC1) drives a flip-flop (IC2a) to generate the required OFF-ON output pattern. The NE555 (a very useful IC) consists of two voltage comparators, a discharge transistor, and output flip-flop. When connected as a free-running pulse generator, the capacitor (C1) is alternately charged through R1-R2 and discharged through R2 and the IC discharge transistor. When the capacitor voltage exceeds the high comparator (pin 6) the output flip-flop is switched off and, conversely, when the capacitor is discharged below the comparator (pin 2), the flip-flop is switched on. The discharge transistor (pin 7) is turned on when the flip-flop is off or when the output (pin 3) is LOW. The reference voltages for the two comparators are available through pin 5 so that the frequency or pulse period can be changed with external (to the IC) circuitry. Without external circuitry on pin 5, the high switching voltage is about 2/3 of the power supply (pin 8) and the low switching voltage is about 1/3 of the power supply.

The pulse generator output (pin 3) is used to drive the oscillator flip-flop (IC2a). Each HIGH to LOW transition of the pulse generator causes the flip-flop to change state. The time of each state (either ON or OFF) is

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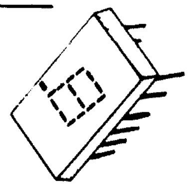

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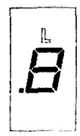

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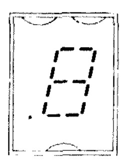

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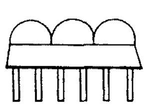

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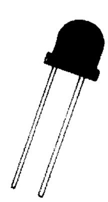

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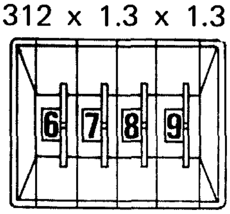

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determined by the pulse generator which is contolled by the voltage on pin 5.

The flip-flops IC2b through IC4b are connected as a 5 bit binary counter which gives a maximum of 32 steps. Only 31 steps are useable since one step is reserved for stopping the generator. The outputs of the first four flip-flops are connected to the appropriate inputs of both multiplexers (IC5 and IC6). The enable inputs of the multiplexers are connected to opposite outputs of the fifth flip-flop. Even though the inputs of both multiplexers are connected together, only one multiplexer can function at a time since the enables are connected to opposite signals. In effect, as the counter proceeds through the first sixteen steps, one multiplexer (IC5) is enabled. The first four flip-flops repeat for the next sixteen steps but the last flip-flop has changed state so the other multiplexer (IC6) is enabled for the last sixteen steps. The diodes (D1 and D2) in effect "or" the inverted multiplexer outputs. Therefore the diode's anode signal is the scanned result (and inverted) of the various multiplexer inputs as the counter proceeds through up to 32 steps.

The generator must be stopped and started and that is the function of the switch and the nand gate (IC7). The nand gate decodes the stop position which is the step following the last dot or dash. As the counter proceeds through the code generation, the nand gate output is HIGH (inputs not satisfied). This output is connected to the J input of the code generator flip-flop. As long as the J input is HIGH, the flip-flop will continue to toggle with the pulse generator signal. When the stop step is decoded (nand gate output goes LOW), the flip-flop will stop in the OFF state. The flip-flop will remain in this state until a start signal is applied.

To start the generator, the start switch is operated. When the switch is closed, all counter flip-flops, the oscillator flip-flop, and the pulse generator are held in a reset state. When the switch is released, the pulse generator starts and, one period later (blank), the code generator switches to the first ON code of the sequence. Thus the start switch does two things; resets the counter

and holds the code generator in the OFF condition.

Programming the generator for various calls is very easy. The code sequence is divided into OFF-ON pairs with the OFF preceding the ON. Each pair is considered one counter step and the pairs are numbered starting with zero. Preceding through the steps, the appropriate multiplexer input is connected as follows: for blank-dash connect to LOW (ground), space-dot connect to HIGH (power supply), blank-dot connect to CODE, and spash-dash connect to the inverted output or $\overline{\text{CODE}}$ (overline indicates inversion).

The nand gate (IC7) inputs are connected to decode the stop step. In this circuit, the counter is never allowed to count higher than the stop step, therefore the gate requirement for the stop decoding is reduced. It is only necessary to ((and)) the counter stages that have decimal equivalents which add up to the value of the stop step. What happens to the gate output for the following counter steps is not important. This simplifies the nand gate requirements to note more than 4 inputs except for step 31. As an example, step 19 is required for DE W9DTW. The decimal equivalents of the binary stages (1, 2, 4, 8, 16) which add up to 19 are 1, 2, and 16. This requires a three input gate (schematic shows a 4 input with the unused input connected to HIGH).

As you may have deduced by now, the total steps is equal to the sum of the dots and dashes plus one for stop. Some calls may not require more than sixteen steps and the second multiplexer and one counter flip-flop can be deleted (enable of remaining multiplexer connected to ground). My call without the DE only requires 15 steps and could be generated with one multiplexer. To illustrate the programming, Fig. 1 describes the connection to program DE W9DTW which requires 19 dots and dashes or a total of 20 counter steps. The large dots on the schematic indicate connections for this programming.

Figure 2 shows various waveforms for the first few steps of the DE W9DTW ID cycle. The first five waveforms describe the inputs to the multiplexer with the solid portion indicating the time when that input will be switched to the multiplexer output. The next waveform is the multiplexer output (inverted form of the selected input waveforms). The oscillator waveform illustrates the control by the multiplexer output. Notice that when the multiplexer output is LOW the oscillator period is short (opposite from previous description because of multiplexer inversion). Each HIGH to LOW transition of the oscillator toggles the code generator flip-flop as shown in the last waveform thus generating the code pattern.

The oscillator frequency controls the code speed and the components values shown will give about 20 words per minute. For other speeds, the time constant (R1-C1) can be changed. Generator speed is inversely proportional to this time constant, e.g. time constant reduced by ½ will double generator speed. Weighting (ratio of dot to dash) can be adjusted with R4 but should not be necessary.

The power requirement for the circuit is 5V at about 175 mA. The two outputs (CODE and $\overline{\text{CODE}}$) are standard TTL levels (3.5V for HIGH and 0V for LOW). Either output should be able to drive a load of 1000Ω or more (some variation in driving capability depending on multiplexer input connections with programming for different calls). The start circuit can be momentarily or indefinitely closed but, in either case, the code sequence will start when the circuit is opened.

There is one construction practice that cannot be over-emphasized for TTL logic systems. Ceramic capacitors (.01) should be scattered around the circuit layout between the power supply and ground. Usually a capacitor for every three or four IC's is sufficient. These capacitors reduce switching current transients which can cause erratic operation. Flip-flops are more sensitive to these currents since false switching can occur. These pulses are very short and difficult to detect so it is better to add the bypasses in the beginning. Otherwise any IC fabrication method can be used for this circuit. I prefer the perforated Vectorboard (pattern P) and Molex pins. This isn't as neat as an etched circuit board but it is faster to fabricate and easier to modify.

. . . .W9DTW

Bill Hoisington K1CLL
Far Over Farm
Peterborough NH 03458

CONSTRUCTING OSCILLATORS FOR 432 AND 1296 MHz

The construction of microwave oscillators for the amateur bands beginning at 432 MHz can be rocky, unless certain principles are observed, as you will see.

The Halfwave Circuit for Oscillators

This type of oscillator circuit is very useful when you start to run short of line length as you attempt to go up in frequency with a quarter wave line. Generally speaking, at 432 MHz you *can* use a quarter wave line which is common practice for that frequency.

At 1296 MHz the length of L1 begins to get very short, and you will do better with the half wave line discussed later on.

432 MHz Oscillator

Please refer to Fig. 1 for the following. A transistor oscillator requires the base to be out of phase with the collector. This assures the use of C2, a brass plate capacitor without leads which is integrated with the ground plane as far as rf is concerned. This works best when positioned directly under the collector connection of Q1, but it still works well a little to one side.

The lead from the base capacitor C2 to the dc bias network should have only dc on it and so can be of any length. But do not run it on top of the ground near L1 or it will pick up rf again. It is best to run it out and down through a hole in the baseboard. The surface of C2 nearest the baseboard should be filed, smoothed, and polished flat. A thin fiberglass sheet preferably no more than 3 mils thick, should be used for a dielectric. This must be held tight, flat, and firmly between the brass plate of C2 and the baseboard. In this manner you will have the base 180 degrees out of phase with the collector, and the oscillator will work.

Of course, while the base is out of phase with the collector, you do not want rf on it. You want to "hold it still" for rf and let the emitter receive the "input rf" by means of the internal feedback. This energy is amplified and some of it is returned to the emitter, thus constituting an oscillator.

How to Treat the Emitter

In this type of oscillator, the emitter should "float free," receive rf from the collector by internal feedback as outlined above, and thus drive the device into oscillation. It will do this. In fact, it will do it so well that you can very easily get into much trouble with persistent oscillation on harmonic frequencies as described in the following paragraphs, if precautions are not taken.

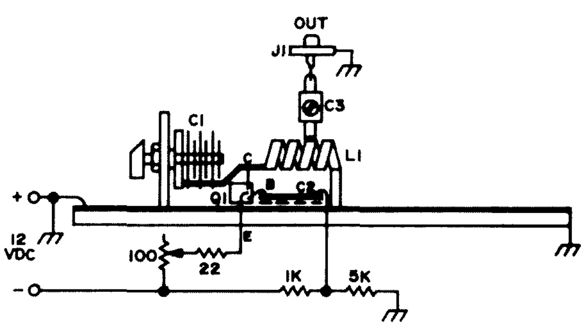

Fig. 1. Good final oscillator for 432 MHz. L1-4T no. 20, 6 mm OD; C1 – Johnson type M, 5 plate; C2 – see text; C3 – 2-8 pF mica trimmer.

Trouble resulting from use of a "hot" transistor, too good a line, and too short a line for L1 is detailed in the following. These three things taken together can spell disaster. I just happen to have a reliable oscillator in my minibox which lights a number 48 or 49 bulb with rf, and puts out a good test signal of some 25 mW on 432 MHz. So to check

out the HEP 56 I set up a similar circuit, as shown in Fig. 2, on a 10 x 10 cm piece of copper-clad, and turned it on. Strong oscillations, rf diode meter moving fine, but tuning completely cockeyed! Where was the frequency? Checks with absorption frequency meters showed it at various places between 950 and 110 MHz. As C1 was moved, the output coupling was varied, and R3, the emitter resistor, was changed.

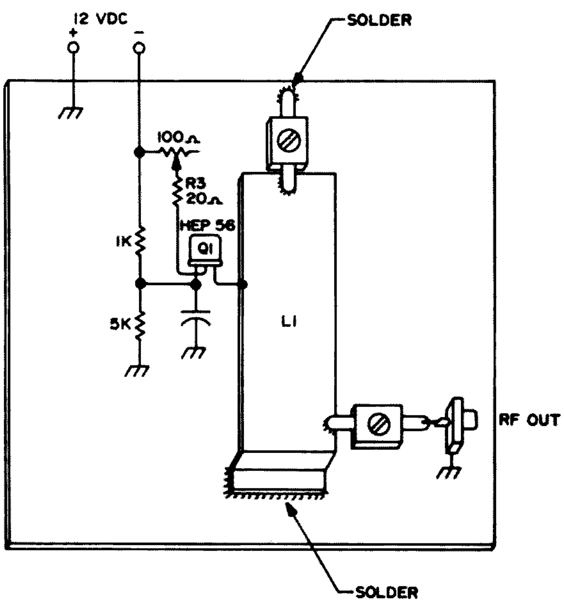

Fig. 2. 432 MHz oscillator circuit to avoid.

L1 and C2 were definitely resonant on 432 MHz, so what was the trouble? After hours went by I finally, in desperation, ripped out the good strap-line L1 and put in a four turn, 6 mm OD coil of number 20 wire in its place. Perfect! Tuned beautifully over the 400 to 500 MHz range, lit a bulb on 432 MHz, coupled out properly, and no trace of oscillation up around 1000 MHz. A straight piece of number 20 wire worked just as well. The original copper strap was just too good, too close to the ground plane, and too wide. All these things promote higher frequencies. L1 was also too short, which made C1 too large, and subsequently made L1 look like it was grounded at both ends. Later tests showed that you can use a strap, but you must make it long enough so that C1 is *small* and it will not jump to the higher mode.

Just as a stunt, the oscillator was tuned up using a regular coil and variable capacitor, shown in Fig. 2. It worked beautifully, tuned up and down over the amater band of 420 to 450 MHz, and even lit a bulb! Suit yourself. You can use either the strapline or the coil. I have both here, but for some reason the idea of a 4 or 5 turn coil tuned by a regular capacitor on 432 MHz fascinates me.

1296 MHz

The Motorola HEP 56 is also adaptable to 1296 MHz. It still oscillates there at one half a mA collector current, with a 6000Ω resistor in the emitter, which we will describe. You do not need to run it that way unless you want low power. That is just one of my tried and true oscillator tests. If an oscillator works at 6 mW dc input and drives a diode meter, it is a good oscillator.

I tried it with a quarter wave line and did get to 1296 MHz but with practically no line left and no tuning possible. Using the half wave circuit of Fig. 3, it tuned from 1200 MHz to above 1500 MHz with the sliding short shown, and handled very nicely.

Semi-Fixed Capacitor Tuning

A number of small ceramic and mica compression trimmers were tried in the position shown by C1 in Fig. 3, but all to no avail. A do-it-yourself C1 worked very well as soon as it was installed. One of the basic principles involved is to be sure that no additional metal touches L1 itself, just have a ground tab come nearer or further away from the center portion of it. If the ground part of C1

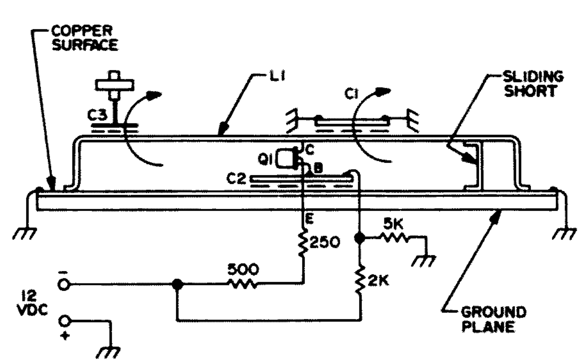

Fig. 3. 1296 MHz oscillator using an HEP 56. L1-10 mm wide copper strap, 90 mm long, spaced 6 mm from ground plane. Sliding short is 57 mm from C3 end. C2 – brass plate, see text. Ground plane is 100 mm sq.

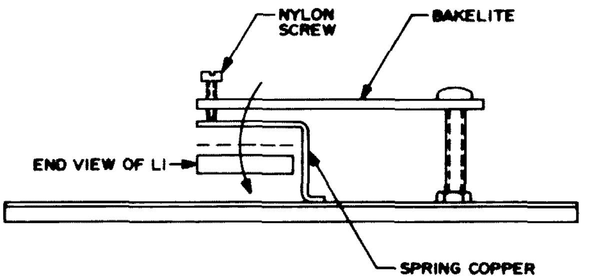

Fig. 4. Spring copper and nylon bolt used for tuning in the 1296 MHz oscillator.

is made of spring copper and a nylon bolt is positioned above it for tuning as shown in Fig. 4, it will do a good job.

Bypass Capacitor Treatment

Cut the baseboard to size by 100 mm smooth and polish it. Cut a 25 mm square piece of brass thick enough to hold itself flat against the smooth baseboard and yet thin enough to solder components to it. This is easier if you bend up two corners as shown in Fig. 5.

Place the brass plate in position, clamp, drill the two holes for the nylon bolts, remove, clean off burrs, flatten, and polish. Mark one side of the plate and the baseboard for later positioning, unless you are a better machinist than I. Position the fiberglass, remove, and cut. I just cut little square holes to fit the nylon bolts with an Exacto knife. It has worked so far. Put the baseboard in a drill vise, and assemble as illustrated in Fig. 6. Every time you do, you can test for rf on it later with the oscillator running and you will not find any. Believe me, it pays to have the base well anchored down.

Emitter

For a good stable oscillator at 1296 MHz there is no need to tune the emitter, although this is useful when you wish to operate at higher power or at its extreme high frequency limit.

Use a good 10W resistor for R and solder it as close as possible to the emitter. Remember that the emitter lead left on, and the lead left on the resistor, both have to oscillate at the fundamental frequency, although this rf voltage will be less than that of the collector in this circuit. Trim up the resistor value with an external pot, and solder in the final value later after tuneup. Note that in doing this you must have some resistor in the emitter circuit to act as an rf choke. You can use a choke but this may cause frequency troubles at first.

The Collector

The primary thing here is L1 and its position in regard to Q1. I find it fits nicely as shown in Fig. 7. Every one mm left on the base and/or collector leads is important at 1296 MHz. Do not leave any more than

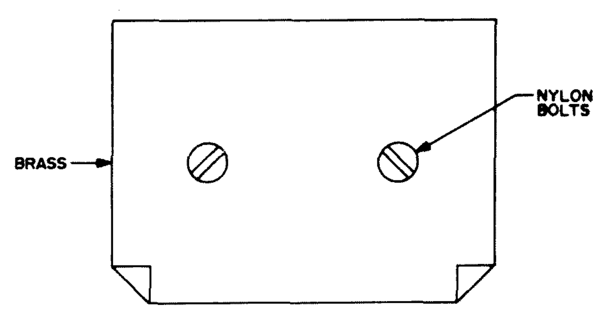

Fig. 5. Bend two corners of the brass for easier construction.

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absolutely necessary. Looking at Fig. 7 you will see that things are pretty short here.

So, if you take care of the base, emitter, and collector as outlined above and in Fig. 3, you will have a 1296 MHz oscillator.

2300 MHz

This one you will find to be like the 1296 MHz job, only different. Well, it's this way. There is a transistor in a half wave line, only it's a different transistor, and the other things are treated a little differently also.

Your amateur license allows you to use pulse on this band. More on that later.

The transistor used for this oscillator is one of the KMC 2N2500 series. I find the 2N2501, the 2502, and the H104 all work at this frequency, in fact, most of them go on up to 2500 MHz. The H104 is retailed by Bill Ashby,president of KMC Semiconductor Corporation, for only $5, a bargain.

The schematic is shown in Fig. 8A, the layout in Fig. 8B, and in detail in Fig. 8C.

The actual unit doesn't look bigger than a postage stamp with a thumbscrew holding it down, but it works! It still oscillates and tunes well at 4 mA of collector current, always a good test. The base should be treated in the same fashion as the similar unit of the 1296 MHz oscillator previously described. Note in Fig. 8B that the brass plate unit is located under L1, and crosswise to it. Make the base lead of the transistor very short, no more than 1/16 in. The length of the lead going to R1 and R1 is of no importance. The dc base bias is supplied by

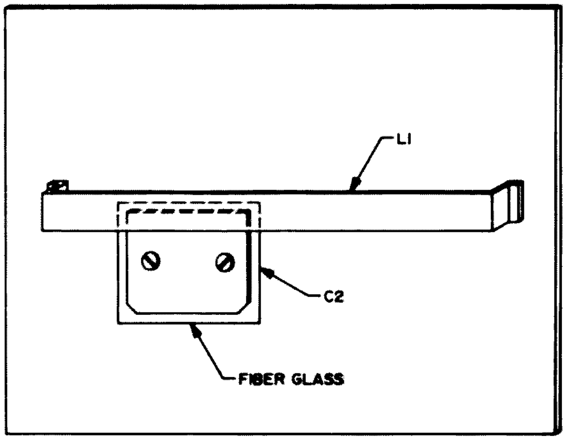

Fig. 6. Illustration of baseboard.

R1 and R2. For maximum power output you can use up to 2K to R2, which puts more positive bias on the NPN Q1. Then you will have to push the current up by lowering R3 and R4; or rather, the final value of R3, if you take R4 out after power trimming, will be lower. Watch those mils when you play with these resistors because Q1 can go out in a few milliseconds if you push the current too far.

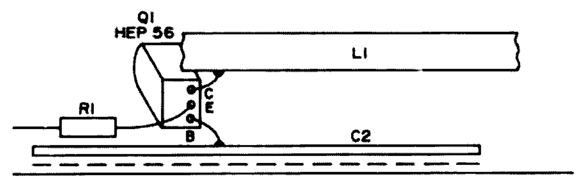

Fig. 7. Q1 assembly detail for 1296 oscillator.

What Not to Do

1. Don't make a 432 MHz collector line that is too short. If you do it is likely to take off on the half wave mode around 900 MHz.
2. Don't make the line too wide. This aggravates condition 1.
3. Don't use a microwave transistor at 432 MHz unless you take precautions. This also can aggravate condition 1.
4. Don't use too high a capacity for C1. This of course stems from number 2 (line too short). The line really looks like a half wave then.
5. Don't couple the output too tight while tuning up.
6. Don't run too much current at first.

What to Do

1. Use a variable emitter resistor and "sneak up" on the output as you tune up.
2. Use enough inductance for L1 so that C1 acts like a small capacity, tuning L1 to a *lower* frequency. If C1 is too large you will simply ground the end of L1 for rf and jump to a higher frequency.
3. Use a half wave circuit from 1296 MHz up. It's better.
4. Use fractional numbers of pF values for tuning and coupling from 1296 MHz and up (e.g. ¼ pF etc.).

. . .K1CLL

EXPANDED RANGE LINE VOLTAGE MONITOR

William P. Turner WAØABI
5 Chestnut Court
St. Peters MO 63376

Expand the 110–120V range over the full face of a milliammeter

Every so often an article appears in an electronic magazine describing an expanded range line voltage monitor of one type or another. Often a special meter or other component is specified which may not be available to the individual. The circuit which follows uses standard noncritical components which are available anywhere in the the country. If even a meager junkbox is available the cost should not be more than a few dollars. A wide latitude in values is permissible allowing wholesale substitution without loss of accuracy. The original, when calibrated against a lab standard showed a maximum error of less than 2%. The range is adjustable to fit your needs and may even be adapted for reading 220V lines by making minor changes in component values.

The power line to be monitored is rectified by D_1 and filtered by C_1, R_2 and R_3 form a voltage divider which holds one side of the meter at half of the rectified line voltage. DC is also applied to R_6, the low voltage calibration pot, through a 3W 110V lamp (or equivalent resistor) which functions as a limiting resistor for parallel Zener diode D3 and as a pilot light. Any increase in input voltage causes the voltage at the junction of R_2/R_3 to increase while the voltage at the slider of R_6 remains constant. This voltage change unbalances the bridge formed by R_2/R_3 and the two halves of R_6 and causes the meter to read upscale. R_4 and R_5 act as multipliers to set the span of the 1 mA meter. If for example the monitor is to read 100 to 150V the combination of these two resistors and the meter movement should total 50 kΩ (1000Ω/Volt), D_2 serves to prevent the meter from reading backwards when the line voltage drops below the low calibration point (during a brownout or when the monitor is unplugged from the line).

The meter may be any dc milliammeter up to 5 mA is the value of R_4 is adjusted to allow calibration within the range of the high calibration pot R_5. The Zener diode may be anything from 70 to 100V at 10W. R_2 and R_3 may be anywhere from 8200 to 15K at 2W so long as they are of the same value. They need not be precision types. C_1 may be from 50 to 100 μF at 200V or more. The diodes may be any power silicon with a PIV greater than 200 and rated for at least 100 mA.

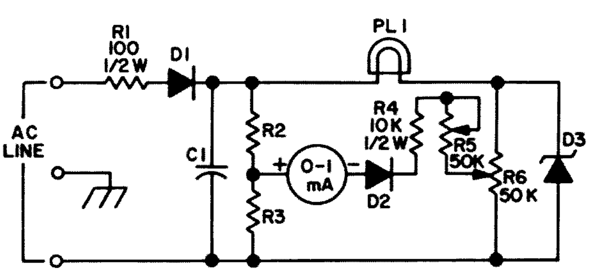

Fig. 1. Schematic of the expanded range line voltage monitor.

Calibration

Set R_6 to approximately center rotation, R_5 to maximum resistance. Then plug the monitor into the power line, allowing one hour for the filter capacitor to "form."

Apply a known voltage at the lowest level you desire to read and adjust R_6 for meter zero. Next, apply the highest voltage desired and adjust R_5 for full scale deflection. Repeat steps 3 and 4 until you have the desired accuracy at both ends of the meter scale.

...WAØABI

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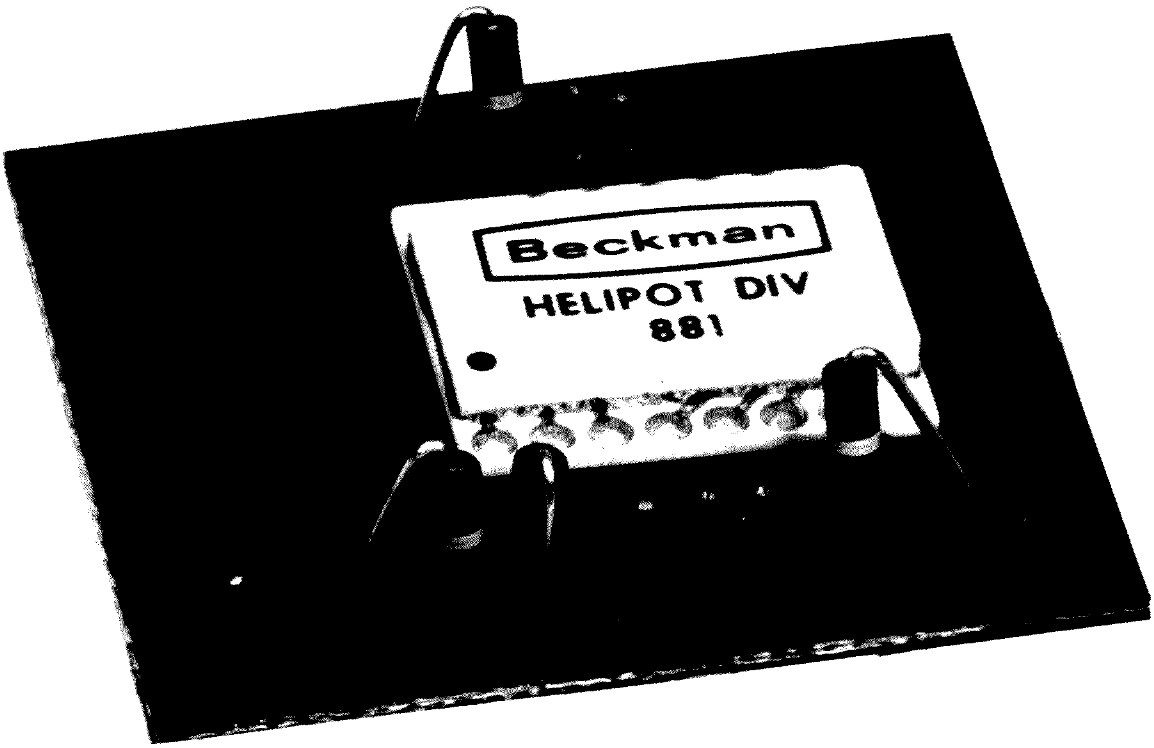

ACTIVE FILTERS

How simple can they get?

The Helipot Division of the Beckman Corp. (Beckman Instruments, Helipot Division Fullerton, Calif. 92634) offers their Model 881 ($25 ea.) universal active filter which can be simply constructed and used as a very effective audio bandpass filter for CW reception or as a high or low pass filter for SSB reception. Because the unit is a special, hybrid, integrated circuit device, all of these filter functions can be achieved by selection of only four external resistors and a ± 9V power supply. The resistor values determine the frequency and Q of the filter. The catalog sheet that comes with the filter gives complete data, theoretical performance

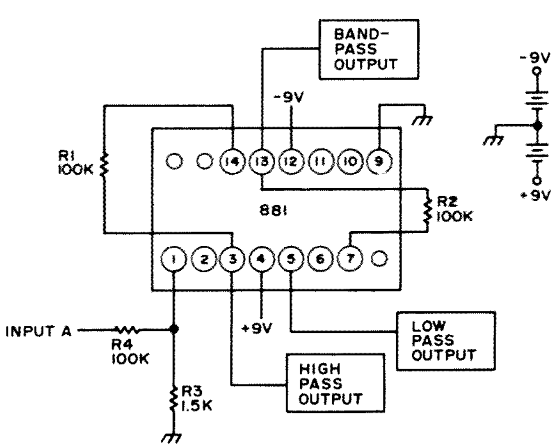

Fig. 1. Connection diagram for the 881 filter.

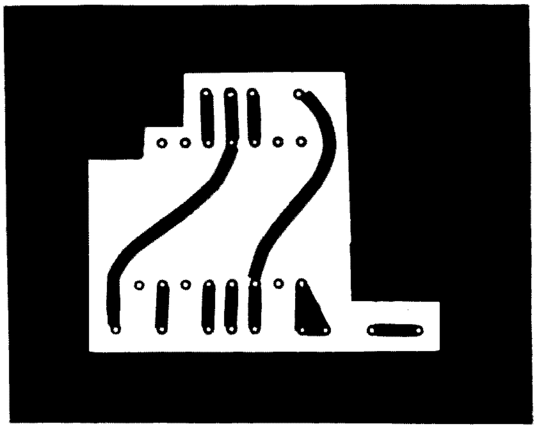

Fig. 2. Full size template (copper side) of the circuit board.

curves and formula to be used for resistor selection.

Fig. 1 shows the connection diagrams for the filter described in this article. For the filter tested the resistor values are:

$$R1 = R2 = \frac{5.04 \times 10^7}{F} \quad \text{center frequency, unity gain}$$

$$R3 = \frac{100K}{(3.48 \times Q) - 2} \quad \text{band pass}$$

$$R3 = \frac{100K}{(3.16 \times Q) - 1} \quad \text{low pass}$$

$$R4 = 100K \quad \text{band pass}$$

$$R4 = \frac{316K}{Q} \quad \text{low pass}$$

$$Q = \frac{F}{\Delta F} \quad \text{band pass}$$

where ΔF is the -6dB bandwidth desired.

The unit is capable of Q's from .5 to 50. A center frequency of 500 Hz and a Q of 50 would yield a CW filter with a 10 Hz bandwidth; really too narrow for normal CW reception.

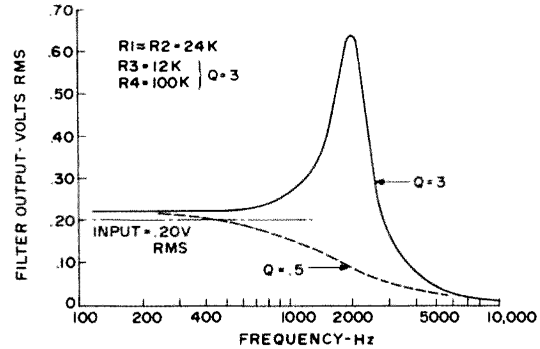

Fig. 3. Characteristics of the 881 used as a low pass filter.

Fig. 2 is a full size template for the printed circuit board and the photograph shows parts placement.

The experimental data obtained with the low pass filter is shown in Fig. 3. Note that a low Q is required for a low pass filter if ringing or voice distortion is to be avoided at the cut off frequency. From the data shown by Fig.3 the optimum Q for a SSB low pass audio filter would be approximately Q = 1.00.

The experimental data for the bandpass version of the filter is shown in Fig. 4. The calculated center frequency was 500 Hz and measured center frequency was 505 Hz. The measured $Q = F/\Delta F = 505/80 = 6.3$ was a bit lower than the calculated Q of 10, however the agreement with the theory is still very good considering that ± 5% resistors were used.

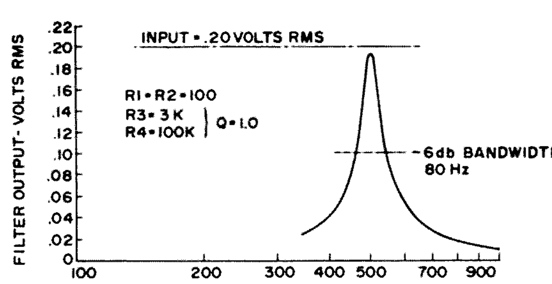

Fig. 4. Characteristics of the 881 used as a bandpass filter.

If R1, and R2 were ganged potentiometers, one could track or peak a signal independent of receiver tuning. The simplicity of the circuitry should offer no construction problems and the size is small enough for QRP transceivers.

. . .W6AGX

Henry B. Ruh WB8HEE
140 Ash
Whitmore Lake MI 48189

VIDEO TAPE RECORDERS

The Lone Ranger rides AGAIN?

Having been a prisoner of the nightly parade of TV sports programs, and a devoté of good movies from the classic, *King Kong to The Thomas Crown Affair,* I've been severly bitten by the wonders of video tape. In keeping with my fond memories of TV programs long lost to the archives of program vaults hidden in TV station basements across the nation, be they *Kukla, Fran and Ollie,* or Edward R. Murrow's *Person to Person, Star Trek* or *The Man From U.N.C.L.E.* it seems only natural to at last own my own video tape recorder for fun and fortune.

There is a growing awareness on the part of TV vidiots (people addicted to TV) of a marvelous machine called a video tape recorder. With it one can record and store the sights and sounds that please us now for enjoyment later. There's nothing quite like watching a good movie after a long day at work (especially when you get home at 3 AM) without having the commercials add to your humdrum (having recorded the program and edited out the beasts).

While the professional VTR's cost upwards of $65,000 there are many inexpensive units on the market; new, used, and surplus which can be had for a reasonable sum. Typically $500 for a black and white and $1,500 for color. These have all sorts of exotic extras depending on what you find and where. Stop action, slow motion, editing, color, audio dubbing, automatic gain control and other features can be found on machines which are suitable for home use. The video recorders are manufactured by many different companies such as Concord, Sony, Shibaden, IVC, Ampex, Akai and others. Each has a different format, and offers different features for your money.

Not being richly endowed, I opted for an excellent black and white VTR which had a good many features and quality for the nominal sum of $450 plus tax and shipping. I was also able to obtain a TV-monitor, a Panasonic TR-900V which is made for use with a home VTR, and is a regular 82-channel TV as well; it even works from 12V dc. A connector on the side of the TV and a switch next to the connector select normal or VTR modes, and it uses a standard cable to mate with the popular home VTR units now on the market. There are a lot of other models around from almost every manufacturer, color and black and white, and they cost a little more than a regular TV. Not all TV stores know of these models, so you may have to do a little looking, or contact the manufacturer of your choice direct. No need to worry, though, since the necessary signals, audio and video, can be found in most TV's anyway.

After smuggling the goodies into the house to avoid the cries of the YL (you never buy *me* anything) and hustling into the laboratory (ham shack) I unboxed my

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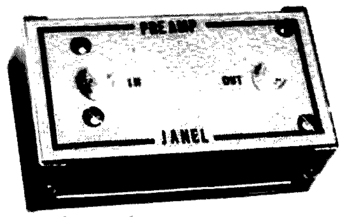

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Aircraft	120PB	108-140 MHz
FM	100PB	88-108 MHz
TV	TV PB	Ch2-13 (Specify)
High Band	160PB	146-174 MHz
432 MHz	432PA	432-438 MHz
440 ATV	432PA-T	435-445 MHz
450 FM	432PA-F	440-450 MHz
UHF FM	432PA-U	450-470 MHz

PB models are only $19.95 and the 432 PA models are only $29.95. All are in aluminum cases, have BNC connectors (others available), require 12 vdc, and are postpaid and guaranteed. Specify model and frequency when ordering. Other models are available with AC power supply. Write for details.
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treasures to see just what I really had. Low and behold, a gleaming black and chrome 60 pound box with knobs, lights, meter, switches, connectors, level and, thank God, an instruction book. After reading the book and messing around for a few minutes, I was astounded to discover that using a video tape recorder was like using any ordinary audio recorder. The record function was a simple button. The level meter and knob was just like the VU meter on my stereo, and the connections amounted to a TV lead to the TV and a single cord from the TV to the recorder. The Shibaden unit I purchased has a switch on the front to select the TV or a Camera input, and a simple diagram on the lid helps you thread the tape. Nothing fancy, just around the tension arm, past the erase head, around the video head drum, past the audio heads, between the capstan and pinch roller and onto the take up reel.

After a few hours behind closed doors to build up my confidence, I braved the YL's scorn and took the unit into the living room. I set it up to show it (and me) off to the family. What do you know! She *liked* it! In a few weeks we had accumulated a closet shelf full of commercial free movies, a *Charlie Brown* program for the kids and a few goodies from some other fellows who have a unit similar to mine.

I didn't think that home VTR's were popular until I owned one myself. Since then I've bumped into lots of folks at recreation vehicle get-togethers, swap and shops, camp outs and other places who have and enjoy home video recording. While talking to other users I found a CAP official who uses his to document air crashes and pilot check flights. He says that a low flyby with the camera out the cockpit window gives a better idea of what happened than a few still shots of the crash debris. He also has a copy of *King Kong* in his library or taped programs. A realtor in the neighboring town advertises his "video listing service" and shows clients his listings in the comfort of his office while they drink coffee. He said that it saves him a lot of time and money rather than taking clients around to different houses all over the area only to find that they aren't really interested in any of them. A record shop uses a video recorder and camera to thwart shoplifters, and recently a national magazine I receive told of the Wisconsin State Police using video tape recorders in patrol cars to record drunk drivers. According to this article they have nearly a 100% conviction rate. I guess one look at themselves wandering all over the road convinces them that they really are drunk.

After you've had a VTR for a while you will be looking for a cheap source of tape. Most home units use ½ inch wide tape, and the electronic parts houses like Allied, Newark and others charge about $39 per hour reel. A few places discount the tape and used tape can be had for as little as $10 for an hour reel. This is a heck of a lot cheaper than film. Especially when you consider that you can re-use the tape over and over again. Communications Unlimited in Whitmore Lake, Michigan, advertises new tape for $25 per reel which is the cheapest I've found. They frequently have used tape as well. In a pinch, it's available most anywhere from companies which sell or service video equipment, who are usually

found in the yellow pages under video recorders and video recording services. The very cheap and commonly available computer tape is very abrasive and will wear out your heads quickly, so caveat emptor.

Since we've had the video tape unit, we've sold our movie camera. We found that had more enjoyment at less cost with the video tape than with the film. We've purchased a lot of film over the years, and most of it has collected dust in a bedroom closet. It seems so bothersome to haul out the projector, screen, cans of film, wait until after dark, find out the bulb is burned out and postpone until the next night the seventy-third showing of Susie and Jeannie at Yellowstone at age 4. With the tape unit we can show any of the tapes anytime, just turn on the TV, sit back and enjoy. When we get tired of a program or some home "movies" of the kids and kin, we can erase and rerecord the tape as much as we like. We put about 200 passes on one tape when the wife decided to learn how to golf, and we used it to help her develop her swing and style.

We live near a lake, and a professional water ski team practises here often. One day the chief honcho noticed my camera and portable recorder and asked if I would record their tricks and play them back so they could see themselves and help them correct some problems in a few of their tricks. At the tune of $10 per hour they enjoyed themselves (as did I) and despite a few compromising shots with the zoom lens, they glady paid (PAID!) for the use of my equipment. That did it. Before you knew it my greed overcame me, and I set about finding all sorts of profitable uses for the VTR. Between taking depositions for lawyers and shooting the duffers on the practice tee. The wife now complains that I'm not paying enough attention to my ham radio!, and a few other items, like mowing the lawn. Oh well. It's a lot of fun, and my whole family enjoys it immensely. If you haven't yet been bitten, don't wait, go find the bug. It's cheaper than 7 nights of TV and beer.

Now if you can't find, or don't want to buy a separate TV to go with your recorder, you can frequently modify your present TV to work with your VTR. The recorder needs a video signal and an audio signal. The video can frequently be found in sufficient quantity right on the output side of the video detector diode. Take the video out through a large (100-500 μF electrolytic capacitor) value capacitor. You need 1-4V of video with negative going sync. This is the normal signal found at the video detector. The audio can frequently be taken from the speaker leads or earphone jack. The VTR puts out a signal of about 1V video and about 1V audio. You can usually tap the audio back into the TV just ahead of the volume control. Use a .01 μF capacitor for coupling and dc isolation. The video circuits in some TV's need 4-10V of signal to produce normal contrast on the screen, so you may have to turn up the contrast on the TV during playback. Since no two TV sets use the same circuit a little trial and error will be necessary to get suitable results. If you have a black and white recorder it makes no difference if the TV is color or not, you just won't see the color during playback. If you have a color recorder, obviously you need a color TV or monitor.

Most recorders "loop through" the video and audio during record or "standby" and this is very useful as you can see what your recording will look like and can adjust the record level accordingly. Most recorders are well enough designed that you would really need a whopping big signal to cause an over deviated signal and poor recording. (VTR's use a single sideband FM signal to record the video signal). If you do hook to your own TV, don't use a "hot" chassis set or series filament TV. This can put ac between the recorder and TV. Use shielded cable for audio and video (72 ohm coax is best for the video) and use coupling capacitors in series with all signals to prevent dc voltages from ruining any transistors at either end. For added help, check the schematic of a TV made for VTR use like a Panasonic TR900V (transistor circuit) or AN69V (tube circuit). Magnavox, RCA and others also make VTR capable TV's, so if you are about to buy a new TV, spend the few extra dollars to get the capability, you'll enjoy it that much more.

...WB8HEE

Thomas E. Hutchinson VE3CWY
35 Warrender Ave. Apt. 208
Islington, Ontario, Canada
M9B5Z5

INEXPENSIVE DECIMAL COUNTING UNIT

Cheap and easy counter.

Most decimal counting units in use today employ the familiar TTL logic IC's in combination with a nixie tube or some type of seven segment readout. The cost per decade of this type of circuitry is \$10 and up (considerably more in Canada). The parts for the unit described herein cost about \$2.50 per decade plus about \$5.00 for associated circuitry; so a 5 decade counter would cost roughly \$5.00 + 5 X \$2.50 = \$17.50. The counter has a few limitations which will be covered later.

How It Works

The events to be counted must first be converted into a voltage level that drops abruptly by several volts at the occurrence of each event. This negative going transition triggers the monostable multivibrator (Fig. 1) which produces a pulse of standardized width (about 1 microsecond). The pulse is inverted by Q3 and delivered to Q4. Q4 is non-conducting until the arrival of a pulse. During the pulse Q4 acts as a constant

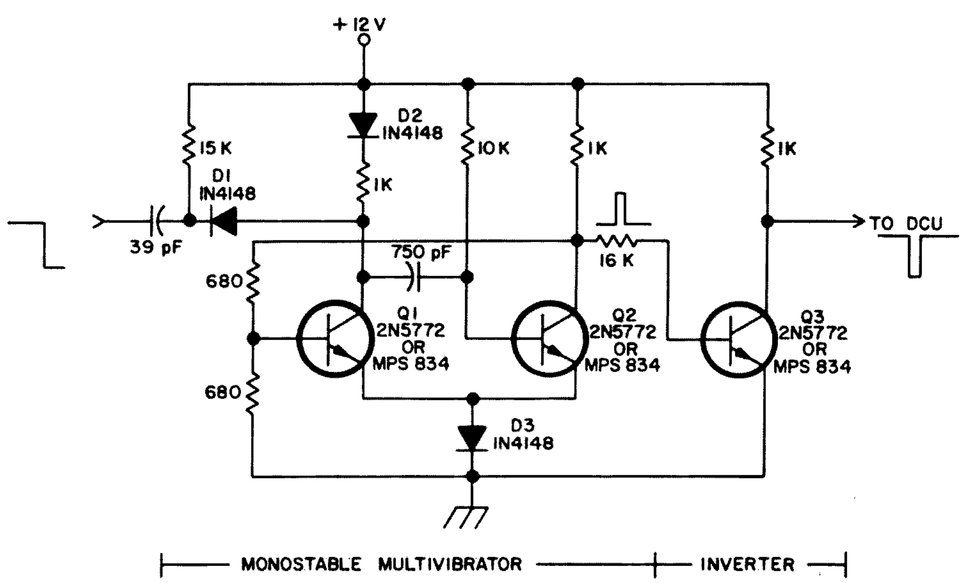

Fig. 1. The input stage converts the negative going event signal into pulses of standardized width.

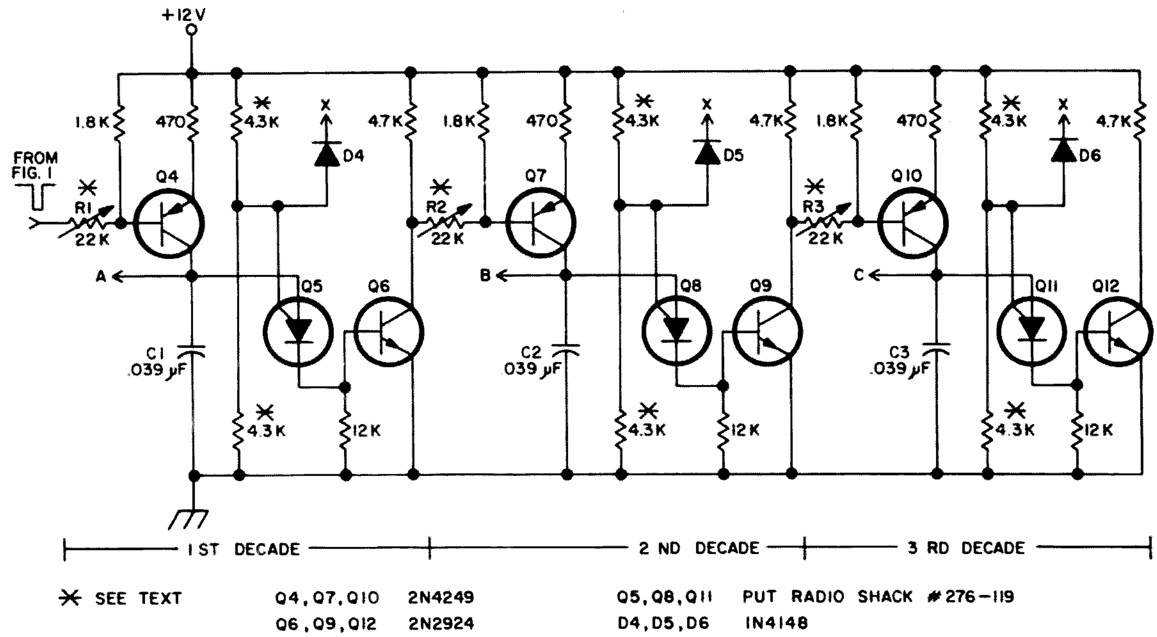

Fig. 2. The circuitry of the three counting decades.

current source to charge C1. With the arrival of each new pulse the voltage across C1 increases step-wise by equal increments until it reaches about 6V; then the programmable unijunction transistor Q5 fires and abruptly discharges C1. The 4.3K resistors at the gate of Q5 fires and abruptly discharges C1. The 4.3K resistors at the gate of Q5 set the voltage at which Q5 fires (hence the name "programmable"). By adjusting R1 one can adjust the magnitude of the collector current that charges C1 and by this means one adjusts the number of pulses required to reach the firing potential of Q5. R1 is thus set so that Q5 discharges C1 on every tenth pulse.

When Q5 fires, it discharges C1 through the base emitter junction of Q6, turning Q6 on momentarily. At the collector of Q6 a brief (microsecond) negative going pulse results and this is delivered through R2 to Q7. Q7, Q8, and Q9 work the same way as Q4, Q5 and Q6, but at one-tenth the speed, of course.

So C2 will accumulate charge on every tenth pulse and C3 will accumulate charge on every hundredth pulse. After 999 pulses all three capacitors discharge on the next pulse and everything starts again.

Since C1, C2 and C3 are charged by constant currents the voltages across them will be directly proportional to the number of pulses that have arrived. These voltages can be easily measured, without discharging the capacitors in the process, by means of thes high input impedance electrometer in Fig. 4. By pressing S1, S2 or S3 the voltage across a particular capacitor is applied to the gate of the FET. This controls the source current which in turn controls the reading on the microammeter. By adjusting the zero set and calibration controls in Fig. 4 the voltage across C1 after 3 pulses, for example, can be made to correspond to 3 divisions on the meter scale and 8 pulses will then correspond to 8 divisions on the meter scale. So by pressing S3, S2 and S1 in succession (in that order) one can read off the total number of pulses that have arrived at Q4.

Initial Adjustments

The first thing to do is to check the values of the 4.3K resistors in the gate lead of each PUT. The pair of resistors used for each PUT must be as nearly identical as possible so that each gate is held at exactly 6V. The best thing to do is to buy about 8 5% resistors and from them select 3 matched pairs with an ohmmeter. It does not matter whether the matched pair for Q5 has the same resistance as the matched pair for Q8 or Q11.

Next adjust R1, R2 and R3 to mid value approximately.

The microammeter shown in Fig. 4 can be your multimeter or any sensitive meter; it need not be 50 μA. It must have a uniform scale of numbers from 0 to 10 (actually only 0 to 9 is used but most meters go from 0 to 10 and there's no point pasting on a new scale). I set my multimeter to the 50 microamp scale and then I used the 0 to 10V scale to make my readings.

Approximate settings for the calibration control and zero set may be made as follows (see Fig. 4); with the 12V supply turned on connect the gate of the FET to a potential of 1.2V and adjust the zero set until the microammeter reads zero. The reason zero reading does not correspond to zero volts on the gate is that Q5, Q8 and Q11 do not completely discharge C1, C2 and C3 respectively when they fire. Next connect the gate of the FET to a 6.0V potential and adjust the calibration control so that the meter reads 9.

Next connect a square wave, sawtooth wave or pulse source to the monostable multivibrator in Fig. 1. The waveform used must fall abruptly by several volts each cycle. The SN7400 series TTL circuits will drive this nicely. If you have an oscilloscope with a sawtooth available at the front panel this will do nicely. Or you can make a simple UJT relaxation oscillator to produce pulses. Select a frequency of about 1 Hz and by depressing S2 you can watch on the microammeter the arrival of each pulse. Count the number of pulses that are stored on C1 before it discharges. Adjust R1 so that 9 pulses arrive and are stored on C1 and then C1 should discharge on the arrival of the tenth pulse. It may be necessary to add some

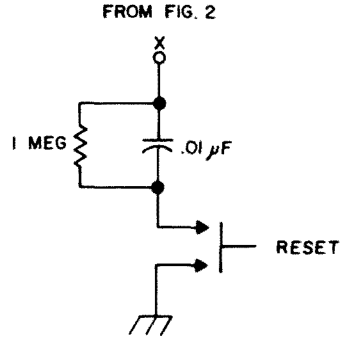

Fig. 3. The reset switch for zeroing the counter. It must be pushed four times.

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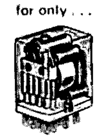

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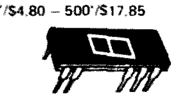

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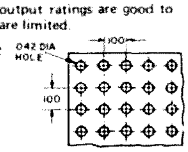

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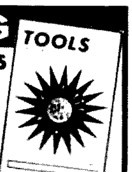

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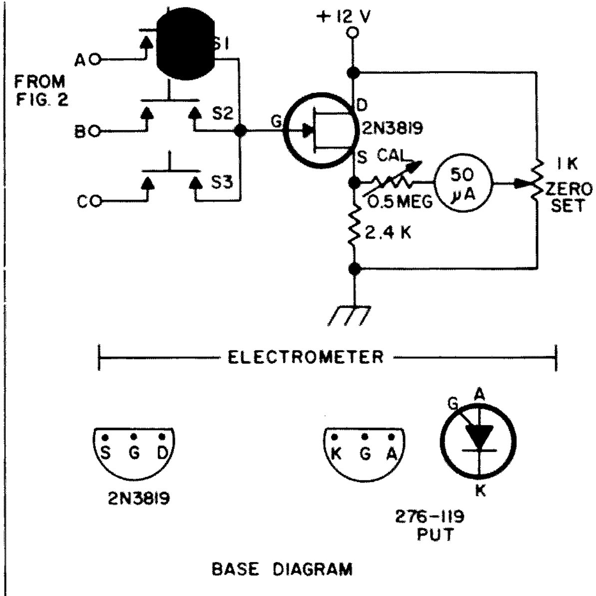

Fig. 4. The output of each decade is indicated separately on the calibrated meter by pushing the appropriate switch.

fixed resistance in series with R1 if Q4 has exceptionally large gain. But since the adjustment of R1 is very sensitive I do not recommend using a larger *variable* resistance. This adjustment of R1 is easily done with an oscilloscope, if you have one. The procedure would be to connect the scope to the source lead of the FET and depress S1. With an input frequency between 60 Hz and 10 kHz to the monostable multi, you should get a staircase wave and by adjusting R1 you can select the proper number of steps as shown in Fig. 5.

After adjusting R1 you may have to make a final adjustment to the zero set and calibration controls (Fig. 4). Always adjust the zero set first; this is done with a low frequency signal applied as above. Wait until C1 has gone through 10 pulses and has been discharged by Q5; quickly remove the signal by disconnecting the pulse input at R1 so that the zero set can be carefully made. Then reconnect the pulse input to R1 and wait for 9 pulses to arrive and disconnect again. Set the calibration control so that the meter reads 9. Reconnect the pulse input. It should not be necessary to further adjust the zero set or calibration.

Next press S2 and adjust R2 so that C2 stores 9 pulses and discharges on the tenth. It will be necessary to increase the frequency of the signal input to the monostable to

about 10 Hz because the first decade will divide this by 10 and give pulses at 1 Hz as input to the second decade. If it is found that the meter doesn't quite read 9 on the 9th pulse, this must be corrected by a slight readjustment of R2.

R3 is adjusted next in the same manner but in this case the signal input should be around 100 Hz.

Additional Notes

It might appear that Q12 serves no purpose. It must be included however because Q11 must discharge through the base-emitter junction of Q12, just as Q5 and Q8 discharge. If Q11 is allowed to discharge in a different manner from Q5 and Q8, C3 will discharge to a different "zero" from C1 and C2.

To reset all decades to zero the circuit in Fig. 3 is used. It temporarily reduces the gate voltage of each PUT to zero causing them to fire. The reset button must be pressed 4 times to encusre that all decades reset to zero.

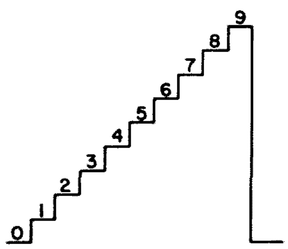

Fig. 5. The value of R1 in Fig. 2 is adjusted to produce this staircase wave at the source of the output FET.

Transistors Q4, Q7 and C10 must have very low leakage in the off state, of course, otherwise C1, C2 and C3 will be charged up by this leakage current; the 2N4249 was chosen for its very low leakage and low cost. Very few transistors combine these two qualities. Similarly Q5, Q8 and Q11 have very low leakage in the off state so as not to discharge C1, C2 and C3.

For switches S1, S2 and S3 it would be better to use a rotary nonshorting switch rather than push buttons but I was unable to obtain one. With push buttons, which are cheaper, the meter often drifts off scale when none of the switches is being depressed.

C1, C2 and C3 would be polystyrene, polycarbonate or metalized polycarbonate types because these types exhibit low leakage and metal capacitance change with aging.

A regulated 12V supply at 100 mA should easily take care of the power requirements to run this.

Limitations

The main limitation of this counting circuit is its low speed. The upper limit is around 25 kHz. Q5, Q8 and Q11 limit the speed in that they cannot discharge C1, C2 and C3 very quickly. If these capacitances are reduced to obtain greater speed you find that leakage currents from the transistors are more easily able to change the charge on these capacitors and the meter readings become unreliable. With a 25 kHz frequency limit you can always scale down a frequency of 1 MHz say to 10 kHz with some SN7490 ICs and then measure this. However you are limited to 5 figure accuracy by this method; if you wait 1 second for a measurement the counter would only get up to 10,000 in this time. To get 6 figure accuracy you havesto count for 10 seconds and that's just too long for most people. Speed is no problem if you're measuring period of time intervals of a few seconds. For example suppose you feed in a 10 kHz signal to the counting unit and you have some event gate it on for about 2 seconds, say; you could get the length of time for the event to the nearest 1/10,000 of a second. It might be 2.1037 seconds. This is probably more accuracy than anyone would ever need.

In Fig. 4 three decades are shown. The practical limit is 5 decades. A sixth decade would count so slowly that the charge on its capacitor would partially leak off between pulses. Incidentally, an accumulated count should be read within 30 seconds or else the readings may begin to drift up or down; 30 seconds is lots of time for a reading.

In summing up we have a very inexpensives counter that consumes little power and is TTL compatible. It requires some initial adjustment and has relatively low speed.

...VE3CWY

Bob Manning K1YSD
West Rye
NH 03891

Up WHISTLE A QSO

With a Krazy Keyless Keyer

The title of this article can be taken quite literally. Whistle, hum, speak or play a tape to key your transmitter.

Although the original motiviation behind the development of the Krazy Keyless Keyer was my own inherent laziness, it ultimately became an extremely useful asset to the CW operation of my shack.

Three items interfere with my full enjoyment of a CW contact; the first is the repetitious CQ calling; second, the inevitable repetitious description of my shack, its equipment, my name and QTH, etc., etc., and lastly sending and resending a lengthy message.

The fact that I unfortunately positioned my telegraphic mill on the right side of my desk causing me to reach over around and behind the mill during rapid QSO's was yet another reason for me to wish that I could somehow key the transmitter with the microphone attached to my earphones.

The problem was to turn audio output into an instrument to make and break a mechanical contact. The answer came accidentally while fooling around with a three channel color organ which used a transformer with a resonant capacitor to gate a 120V scr thus lighting appropriate lights. If it would turn on a light, it should turn on an ac relay. It did and it does.

T1 is a salvaged driver transformer from a junked transistor radio. Normally there are two transformers in these small radios, one is yellow – the other blue – and the blue one is usually the driver with a 5:1 impedance ratio. The dc resistance measures approximately 100–200Ω on one side (make this the primary) and 500–600Ω on the other.

C1 forms the resonant frequency somewhere in the mid-range of the audio spectrum. It can be increased or decreased to accommodate your tape recorder output or the tone you prefer when recording. C2 can be increased to improve sensitivity. The relay should be a 105–125V ac relay. R2 is a current limiting resistor to the ac relay. C3 provides voltage to the relay during the half cycle that the scr is off.

Hash from the scr is minimized by the 1 KΩ resistor and none was noted during operation of the unit. Any key clicks that

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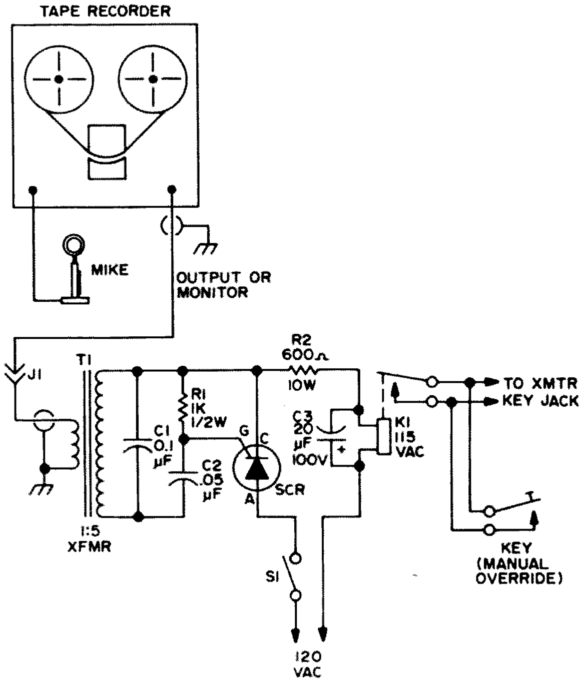

Fig. 1. The Krazy Keyless Keyer in all its glory!

you may have had with a normal key will probably still be present and an appropriate key click filter should be added to the relay contacts.

If junk or salvaged parts aren't available, commercial units can be used. The transformer would be a Radio Shack driver (273-1378) primary 10K secondary 2K (reverse when putting in keyer). SCR Radio Shack's 276-1067, GE-ZI or C106 will work. CI is approximately .1 μF paper, C2 is a .01 or higher ceramic or paper. R1 is a 1 KΩ ½W and R2 is a 600Ω 10W resistor.

Any tape recorder may be used. I use a cassette type with a monitor jack. The monitor is not essential, but unless you have a side tone in the transmitter, you should have some way of telling what's being sent. A home-brew sidetone can, of course, be connected to the relay.

Now, with a stock of caller tapes, record opening QSO information and a goodly portion of canned information, jokes and sea stories on separate cassettes, I can simply assume a horizontal position and have quite a CW contact.

If someone will just come up with a perfect coffee maker I will attain complete inertia!

. . .K1YSD

Bill Hoisington K1CLL
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Here we will detail the breadboarding, circuit design, padding for 2 MHz full dial spread and coverage, and results on ten meters.

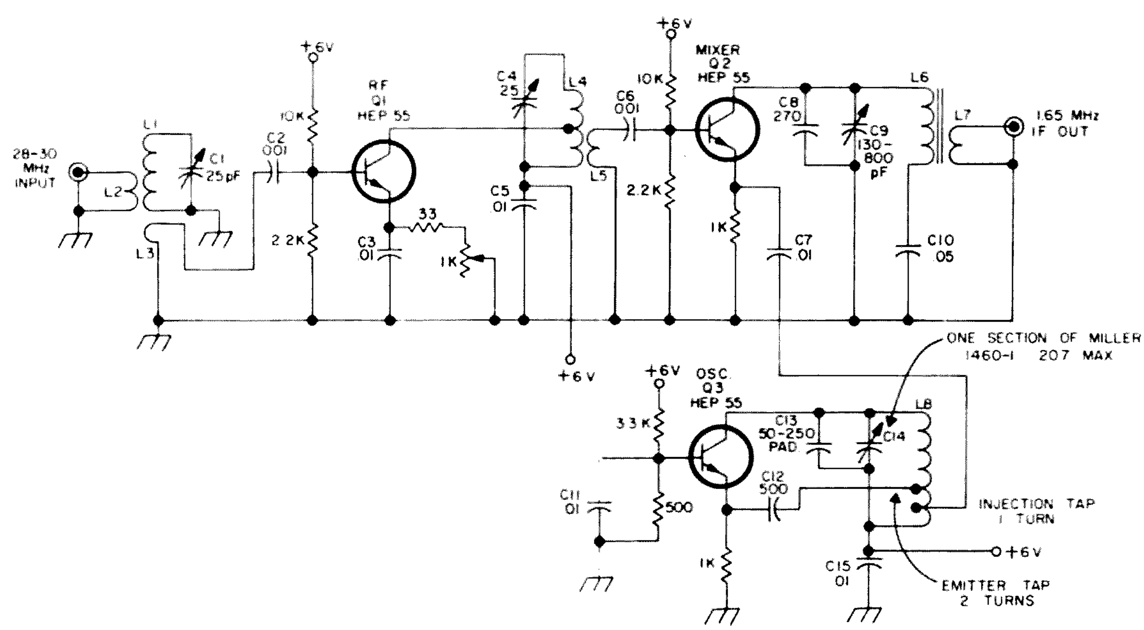


Fig. 1. Overall converter schematic. L1, 17 turns, 15 mm OD, 25 mm long; L2, 3 turns on cold end of L1; L3, 1 turn on cold end of L1; L4, 11 turns, 8 mm OD, 35 mm long; L5, 2 turns on cold end of L4; L6, 21 turns No. 30 inside cup core from Millen 10C; L7, 4 turns No. 30 wound over L6; L8, 5 turns, 15 mm OD, 8 mm long, mixer tap at 1 turn, and emitter tap at 2 turns from ground.

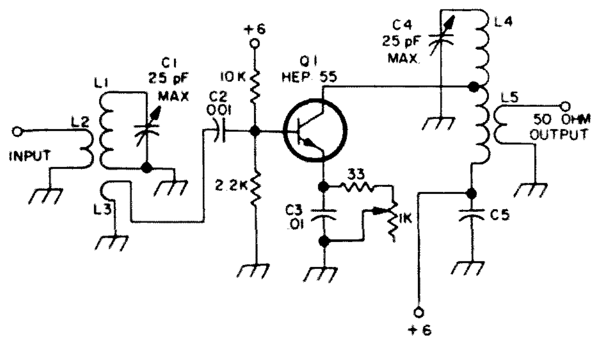


Fig. 2. Rf stage, ten meters.

The *method* of testing is stressed, so you can use components that you have on hand.

The Overall Circuit

Figure 1 shows what we have. All three stages have been worked on extensively to provide a maximum possible guarantee that it will operate correctly when you build it. The rf stage has been engineered to prevent self-oscillation, the mixer for good gain and freedom from pulling on the oscillator, and the oscillator for high reserve power.

Using the components specified and the exact circuit, you will find that it handles extremely well, without a trace of oscillation in the rf stage, and tracking is made easy by the smooth tuning of all three circuits.

The Breadboard Setup

Quite an extensive affair was assembled with three separate but similar tuning capacitors in order to work out the exact circuit itself with coil and capacitors before building it into the compact form for use as a mobile and portable unit. The unit is designed around that intriguing little three gang job by Miller (their part No. 1460-1) which is only 2.5 cm wide!

This breadboard allows you to work out the inductance you need, the impedance matching windings and taps, the dc values, etc. In other words, after finishing the breadboard you should have a smooth-operating circuit with all the components and values determined and be able to concentrate on the mechanical assembly and design you want for packaging

With this breadboard layout you can work out any variations you have in mind, or substitutions of similar components, and check their operation before final assembly.

The Rf Stage, 28–30 MHz

Requirements

Two tuned circuits, reasonable gain, good noise figure, very good tracking capability and padding, freedom from self-oscillation, input and output impedance matching.

One of the things that is interesting in a transistor rf stage is the question of feedback causing self-oscillation. The engineers working hard to produce good devices have a parameter called "reverse transconductance." In plain English this is simply the old devil built-in internal feedback, collector to base – exactly the thing you *don't* want. You've seen it before in triode tubes if you're of that age, and it is simply the same as the old plate-to-grid capacity all over again, plus some resistance thrown in to make it a little tougher to lick.

Manufacturers claim certain IC's reduce this effect way down, but right now, working with a single $1.20 transistor, we're back close to the neutralization business again. Another nasty feasture of this is the *rise* of this nuisance with frequency.

We place a lot of faith in adjusting the base winding, or tap, to avoid this condition, having used this method with success on 1.65 MHz. This faith was justified, as you will see, at least for 28–30 MHz.

A breadboard rf stage was set up with care (see Fig. 6) to allow the needed changes for determining the proper parameters as outlined above, and this one really paid off. Figure 2 shows the circuit, with details.

The input is adjusted by the turns of L1 and its coupling to L2. Input tuning is done with L2 and C1, and the amount of base input drive, which is very important for feedback control, is adjusted by L3. A tap

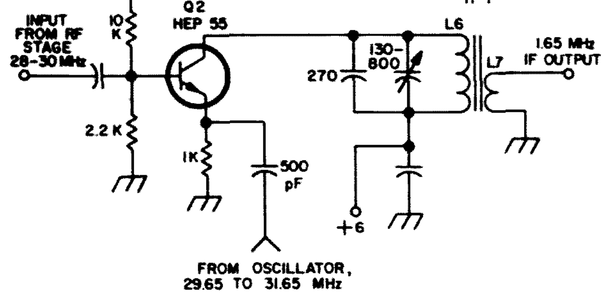
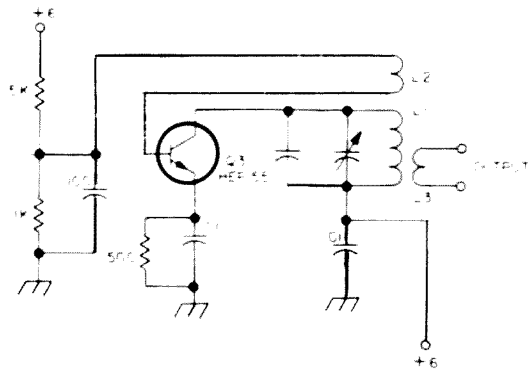


Fig. 3. Mixer stage.



NOTE: SEE FIG 5 FOR FINAL CIRCUIT USED

Fig. 4. First oscillator.

on L2 also works, but the single turn coil L3 is easier to adjust, so it was used in the final circuit.

The transistor used is of course our "Universal" one, the Motorola HEP 55 which is turning out to be a real low noise one, as well as universal. The emitter bias is temporarily adjustable, with a limit resistor R3 as well as a pot of 1K. Base bias is supplied with the usual 10K and 2K resistors and isolated from L3 by C2. The collector is tapped onto L4, which is tuned by C4. L5 couples the amplified rf out to the next stage or to a receiver if you are using this unit as a preamp.

Here are the results:

A. The collector tap has little or no influence on the amount of feedback causing oscillation. It does have an effect on bandwidth and tuning and thus a little on image suppression, but not much on gain. It is not critical.

B. The base tap, or size of L3 and its coupling to L2 has a very large effect on the feedback. A one turn loop with adjustable coupling to L2 around the cold end seems the best. With two turns for L3 oscillation occurs when L2 and L4 are tuned to the same frequency. With one turn none took place, and there was still plenty of gain. The present, or breadboard, L2 is 17 turns air-wound, 14mm OD, 6 turns per cm; however this is not yet padded for bandspread on the dial for 2 MHz.

Two types of tests were run on this rf stage, the first as a preamp in front of my lab receiver. This was really amazing. With

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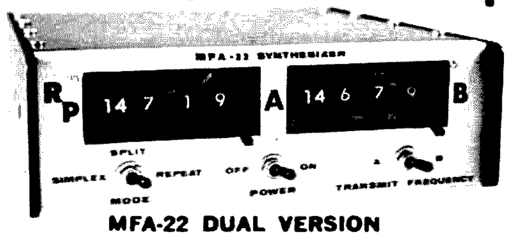

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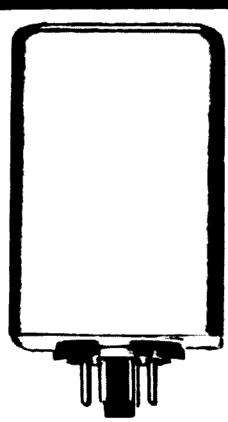

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the rf stage in front, stations were coming in readable that could not even be heard without it. This was on the good old "100 ft piece of wire" by the way.

Gain

Note this point. The difference with and without this stage being so noticeable, I disconnected the receiver entirely and just used the rf stage with a tuned diode detector and a $5 Lafayette audio. I heard about six stations on ten meters with this *one* rf stage and diode detector without any other receiver! Enough on the gain. You don't really need all that much anyway, but it's nice to know it's there.

Good freedom from spurious was noted, due to the filter action of the two tuned circuits on ten, L2 and L4.

As usual, this one stage took over an entire day to build, tune, adjust and confirm. The results are certainly well worth while though, and the unit also worked fine as the rf stage of the tunable converter, as you will see later.

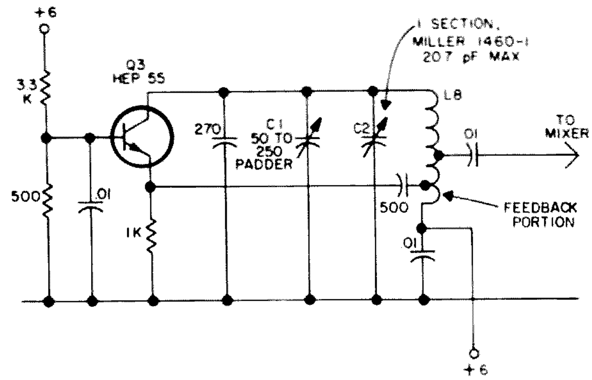

Fig. 5. Final oscillator, 29.65 to 31.65 MHz.

The Mixer

This transistor (refer to Fig. 3) is base-coupled to the rf collector circuit, and oscillator injection is brought in to the emitter. The collector is then tuned to the lower beat note of 1.65 MHz and sent out to the i-f strip, or to your lab receiver for testing. A tuned diode on 1.65 MHz is also good for testing purposes.

Sounds easy. There are a few little details though. Oscillator injection is one. Where to bring it in, how much, oscillator "pulling" also, which is a change in the oscillator frequency due to the effect of the mixer base tuning.

Going through Fig. 3 in detail we have a common emitter connection with signal applied to the base through L2 which is not critical. L1 is the preceding stage collector coil. R1 and R2 establish the base bias, and R3 the emitter bias.

Note that while the emitter resistor may not appear to be bypassed, it actually is, as reference to the whole circuit, Fig. 1 and the oscillator circuit Fig. 5 shows. The injection lead has a .01 capacitor in it and the other side of this capacitor is connected to ground through a one turn portion of the oscillator coil which constitutes a low impedance connection to ground at ten meters. Thus the oscillator energy is brought into the mixer through the emitter and will be found quite free from frequency pulling when the mixer is tuned.

The mixer collector goes to T1, primary of which is tuned to 1.65 MHz. Keep in mind that a ten meter signal and the local oscillator used – when beating together in a

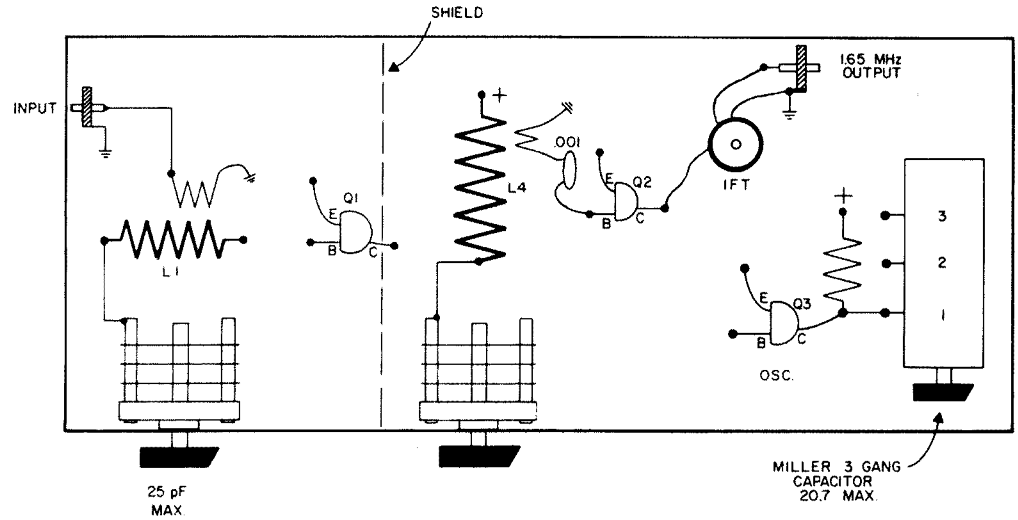

Fig. 6. Layout, 10 meter front end, breadboard.

mixer – always produce four frequencies. In this case they are:

1. The signal on 28 MHz
2. The oscillator on 29.65
3. The oscillator plus the signal, 57.65 (not used)
4. The oscillator minus the signal (used as the i-f)

Number 4 is sent out to the i-f strip on L7. And that's that for the mixer.

The Oscillator

I'm certainly not a fanatic on regulated supplies but this oscillator stage is generally used in the ten meter tube receivers. However, with battery operation maybe we don't need one. So far it looks as though we can do without it.

A common trouble in ten meter receivers in the past has been loss of oscillation with age. The oscillator *must* have plenty of reserve power and yet not produce strong harmonics. This may not be easy because all ordinary local oscillators are class C jobs and operate with plenty of harmonics.

Good shielding and plenty of in-band signal from more than one rf stage can always be used to swamp out spurious in most cases.

The first oscillator used is shown in Fig. 4. This one is our standby for fixed tuned jobs, but it gave trouble right away. So I must have changed something. I had. Instead of putting the collector on the high end of L1 I tapped it down on the coil for tracking purposes, the idea being to use a set of three similar coils all alike with base and collector tapped down to avoid dissimilar tuning. Nice theory but it didn't work too well. Squegging appeared on part of the tuning range which is a real menace. This is also known, by the way, as superregeneration when properly regulated, but we don't want it here either! After restoring the collector to the high end of the oscillator coil we checked the whole operation and worked on the padding capacity needed to cut down the tuning range to the desired 2 MHz, plus a little extra for dial ends. The conclusion reached was to change the oscillator circuit. Never mind that stuff about "horses in the middle of the stream," there are times when all things call for a change, and you *have* to go to another circuit. When a large tuning range or a lot of padding are needed, the circuit of Fig. 5 is best, and it turned out very well here. The main feature is that the entire oscillator inductance is tuned, *including* the feedback portion. Note in Fig. 5 that this part of the coil is in the coil itself and therefore it tuned along with the rest of the coil. The presence of a large capacity, C1 and C2 directly across the coil tends to maintain the desired out-of-phase relation between the base and the collector.

With a given variable capacitor you may have to use a lot of capacity padding in order to spread 2 MHz over the dial.

Although you could remove plates, the Miller three gang job looks so nice the way it is I would hate to start cutting it up. Also, a large fixed capacitor such as CI and C2 in Fig. 5 tends to stabilize the oscillator and cuts down on oscillator frequency variation due to collector or base capacity changes. In order to do this you should have a *good* CI and a good C2. CI is air-insulated and cannot be improved on very much. C2 is a mica-compression trimmer and should also be all right, keeping in mind that we are not shooting for operation in military-type below-freezing-to-boiling-water environments. I have had trouble in the past though with High-K dielectric capacitors shifting right out of the i-f passband when getting out of a warm car into the breeze on a hill-top in the fall. So keep that in mind.

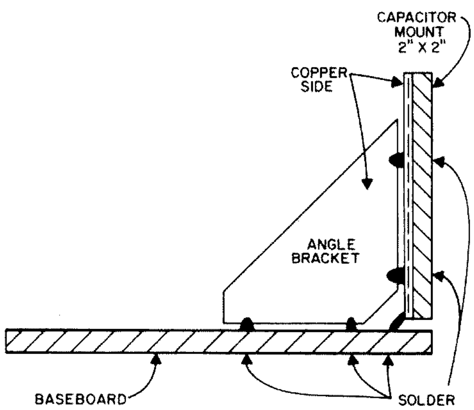

Fig. 7. Capacitor mounting.

The oscillator of Fig. 5 appears to be one of the best I've made yet. The circuit itself I might say is quite standard and is used in a number of commercially produced receivers. It is so stable and so well bandspread in this case that foreign ten meter stations can be easily tuned in using a small knob without any slow motion attached.

Layout

Should you wish to test some slightly different components on hand, or wish to try some circuit variation, etc., the layout of the breadboard is given in Fig. 6. Plenty of space is allocated for each of these stages, and yet they are close enough so that the leads interconnecting them are not too long for ten meters.

One section of the three gang capacitor was used to tune the oscillator in order to find out what amount of padding was needed, as well as the coil, for spreading the desired 28 to 30 MHz over approximately 10 to 90 on the dial. These values are detailed in Fig. 1.

The following hints and kinks for breadboard work may be useful for you. Figure 7 shows an easy method for mounting small, single, variable capacitors on a copper-clad baseboard.

When checking the frequency of an oscillator *always* find the *fundamental* with an absorption wavemeter. And remember that once in a while you could encounter an oscillator working gaily away on two frequencies at once! It's happened to me.

Oscillator squegging can be heard on almost any receiver tuned on or near the frequency. Tuning is broad because of super-regenerative action.

Watch out for loop tuning of components and ground leads. Granted, this is a nasty one. Can happen most easily when several components are going to ground from one tuned circuit and the same ground is not used for all leads. This does not apply to the dc filter sometimes used. This can be difficult but can be checked by using a tiny square .001 or .01 capacitor cemented onto a "coffee-stick," with about 1/8th inch leads protruding. Touch these leads from a suspected tie-point to ground.

Tune in the converter every once in a while with the gain of the receiver being used way down, so that gain differences are not swamped out by avc action. You may not need all the gain of this front end, but it's nice to have it available.

Results on Ten

This delayed the work here quite a bit, because I started hearing the sort of stuff I hadn't heard for years, and I stopped and listened to the band for some time.

The method of breadboard design has been stressed to help you work out the problems of a ten meter tuner, battery operated, and to get you on the air

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AN IC FACSIMILE RECEIVING CONVERTER

Back in August and September of 1971, *73* published a couple of articles on facsimile, one of my unrequited loves. I read the articles with great interest and, a few days later while on a routine visit to a local surplus dealer, I met my first FAX machine. It was an RD-92A/UX Facsimile Recorder, and I bought it. Now, all I had to do was get it home (it was kinda big), plug it into the station, and I was in the FAX business. Right? Wrong! I got it home all right, but there were still a few things I had to learn about FAX. One was where to get the special electrostatic recording paper the thing needed. Another was how to get some intelligence onto the paper from the funny sounding signals I could hear on my receiver. Well, I got the paper from Fitchburg CPI, Scranton, Pennsylvania, and I built the receiving converter myself.

Before I could build the converter, I had to figure out what it was supposed to do and how it was supposed to work. A study of the earlier articles revealed that most FAX machines prefer to digest an audio subcarrier that is amplitude modulated with the picture information and that the normal HF radio transmission mode was direct FM or FSK of the RF carrier by the picture information. I found that the converter usually processed the audio as received by an SSB type receiver. The converter I built consists of a limiter (to remove amplitude noise and signal fading effects) followed by a low pass filter. The low pass filter, by virtue of its roll-off characteristic, converts the audio FM signal to an AM signal with a variable carrier frequency. The FAX machine is insensitive (over a range) to the frequency of the subcarrier input, only the amplitude – so the variable carrier frequency causes no trouble.

The normal deviation of RF FAX signals is 800 Hz and the receiver is usually tuned to put the recovered audio into one of two standard frequency ranges: 1500 to 2300 Hz or 2300 to 3100 Hz. The RD-92A has a bandpass input characteristic designed to pass the latter frequency range. Black is represented by 2300 Hz and white by 3100 Hz. In between is gray. Experiments with the machine and paper indicated that the black input level should be about two times the white input level to provide a fair gray scale for pictures (sent by FM) and sharp lines for maps (sent by FSK). The slope and cutoff characteristics of the converter's low pass filter were selected accordingly.

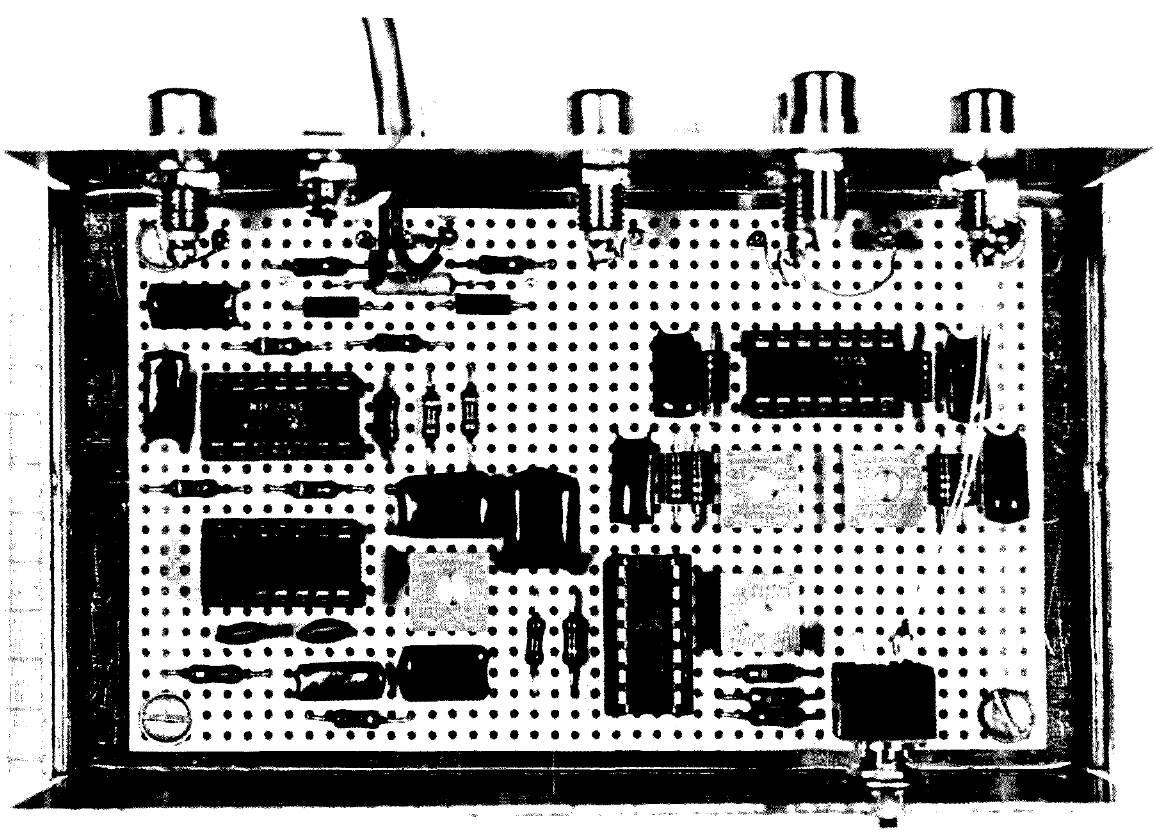
Construction Details

The converter was built on a piece of 0.1 in. grid perforated board (Micro-Vectorboard). All IC's used were DIP's and were mounted in sockets. The capacitors used, except the electrolytics, were low voltage polyester film types made by International Electronics Corporation (IEC). They were Series EM and are low in cost, small in size, and stable.The pots used were Beckman Series 72PM. These are 3/8 in. square, PC mounting, screwdriver adjust, single turn units that sell for about 70¢ each. Very nice! The converter board was mounted in one minibox and the power supply in another.

My receiver has a low level audio output for accessory gadgets so an input amplifier is included in the converter. It is an LM741C op amp connected as an ac coupled non--inverting amplifier with a gain of about one-hundred one. This gain is suitable for use with inputs up to 100 mV. If the input is expected to be larger, the gain should be reduced by increasing the value of R6. The output of the stage is capacitively coupled to a voltage divider and reduced by 50% to prevent overdriving the limiter input.

The limiter is a slightly compensated LM709C op amp operated in the open loop configuration. This means that the op amp output will be driven to saturation by very small input signals. The effect is to remove amplitude variations from the input signal and produce a constant amplitude, square edged output signal. The inverting input of the 709 is bypassed and returned to a pot to allow the limiter threshold to be set at precisely zero volts. This insures maximum sensitivity. The output of the limiter drives the low pass filter.

The low pass filter is a three pole active device using an LM747 dual op amp with both sections connected as voltage followers. The filter characteristic is nominally a Butterworth with a cutoff frequency of 2300 Hz. The first pole of the filter is formed by R3, R4, and C4. This section also



Inside view of the receiving converter. Toggle switch is for shifting BFO in the receiver.

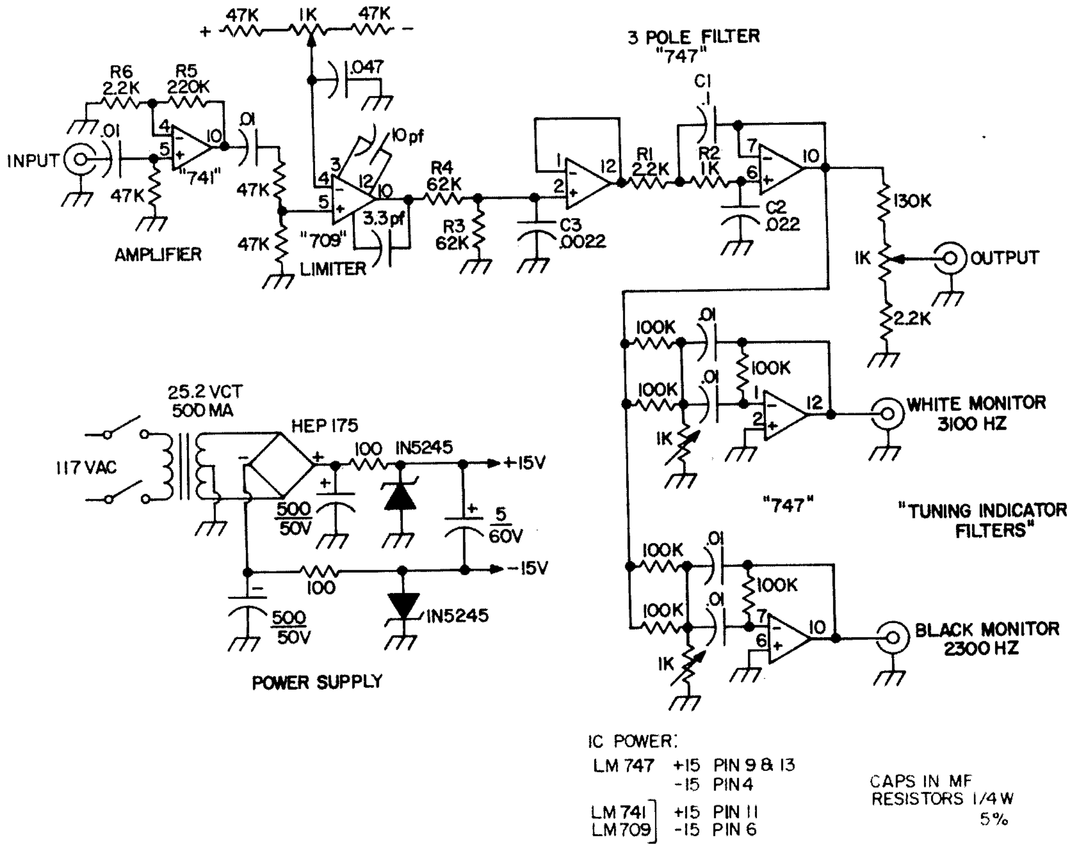


Fig. 1. Converter schematic.

provides a signal reduction of 50% to prevent overdriving the first voltage follower. The second voltage follower and C1, C2, R1, and R2 form the other two poles of the filter. More about active filters later.

Ordinary 5% composition resistors and 10% capacitors were used to build the low pass filter. This means that, if the component tolerances gang up, the deviation from the ideal filter characteristic could be quite great. Generally, this doesn't happen and – in any event – this application does not require a precise filter. The filter should be built and the response checked. The filter output at 3100 Hz should be about 53.5% of the output at 2300 Hz. The response for an ideal filter is listed in Table I. At frequencies below 2300 Hz, the filter output, ideally, will increase and finally level off at about 141% of the output at 2300 Hz. At frequencies above 3100 Hz, the filter output will decrease until it disappears into the noise level.

The output of the filter drives the FAX machine through an attenuator network with a pot. The range of the output adjustment is small because the RD-92A has a thirty step input attenuator and the pot need only cover one step. The output of the filter also drives the inputs of the tuning indicator filters. These are active two-pole band pass devices built with one LM747 dual op amp. Each filter has a bandwidth of about 300 Hz and the center frequency is tuned by a single pot. One filter is tuned to 2300 Hz (black) and the other to 3100 Hz (white) and their outputs would normally feed the horizontal and vertical inputs, respectively, of an oscilloscope. The filters have unity gain at their center frequencies and are driven from the low pass filter output to insure a pleasing scope pattern. If driven directly from the limiter output, the filters distort and the scope pattern has kinks in it. The scope gain controls can be used to compensate for the fact that the 3100 Hz filter output is lower than the 2300 Hz filter output.

Power to all stages is provided by a simple, zener regulated, dual voltage power

supply. Plus and minus 15V was used mainly because I happened to have the diodes on hand. Other voltages, down to about plus and minus 10V, should work equally well. Regulated voltages are required because the limiter output (clipping levels) peak-to-peak voltage is determined mainly by the supply voltages.

Active Filters in General

The technique used to build the low pass filter used in the converter should find many uses in amateur equipment. It is called a Voltage Controlled Voltage Source (VCVS) synthesis and is so cheap to do that it is competitive with inductor-type filters (especially at audio frequencies). A VCVS is basically an amplifier. It provides a high input impedance, a low output impedance, and an output that is directly controlled by the input voltage. The voltage follower is an especially simple device that meets that meets these requirements. It has a gain of very nearly one (when made with a high gain op amp) so filters synthesized with it will have a gain of one (generally). A VCVS synthesis may be used to realize any type of poles-only high or low pass filter characteristic.

Filters are described by their cutoff frequency, roll off rate, and the shape of their frequency response characteristic. The cutoff frequency is often defined as the frequency where the filter response is reduced to 70.7% (-3 dB) of the pass band response. The roll off rate is the ultimate rate at which the filter response "heads for" zero beyond the cutoff frequency. As the frequency gets further from the cutoff, the actual filter response gets closer to the roll off rate. At one frequency decade (a ten to one ratio) beyond the cutoff, most filter response curves have reached the roll off rate. The roll off rate is determined by the number of poles in the filter and is equal to 20 decibels per frequency decade per pole. The shape of the filter frequency response can be almost anything, but three types have been found to be the most useful: Butterworth, Bessel, and Chebychev. A Butterworth filter has a maximally flat pass band response and makes the transition from the pass band to the roll off rate moderately fast. A Bessel filter provides linear phase response in the pass band at the expense of a rather slow transition from the pass band to the roll off rate. A Chebychev filter provides the quickest transition to the roll off rate, but it has a ripple in the pass band. Amplitude frequency response curves for a four-pole low pass filter of each type are shown in Fig. 2.

	Freq.	Butterworth	Bessel	Chebychev
	0	1.000	1.000	1.000
	.05	1.000	.999	1.005
	.1	1.000	.997	1.018
	.15	1.000	.993	1.039
	.2	1.000	.987	1.064
	.25	1.000	.980	1.089
	.3	1.000	.972	1.109
	.35	1.000	.961	1.118
	.4	1.000	.949	1.112
	.45	.999	.937	1.093
LIN	.5	.998	.922	1.064
	.55	.996	.906	1.035
	.6	.992	.889	1.011
	.65	.984	.870	1.000
	.7	.972	.850	1.007
	.75	.953	.829	1.035
	.8	.925	.807	1.080
	.85	.886	.783	1.117
	.9	.836	.759	1.081
	.95	.775	.733	.923
	1.0	.707	.707	.707
		dB	dB	dB
	1.0	-3	-3	-3
	1.2	-7.24	-4.5	-13.07
	1.5	-14.25	-7.42	-23.75
LOG	2.0	-24.10	-13.41	-35.64
	2.5	-31.84	-19.52	-44.17
	3.0	.38.17	-25.09	-50.91
	4.0	-48.17	-34.43	-61.29
	5.0	-55.92	-41.92	-69.22

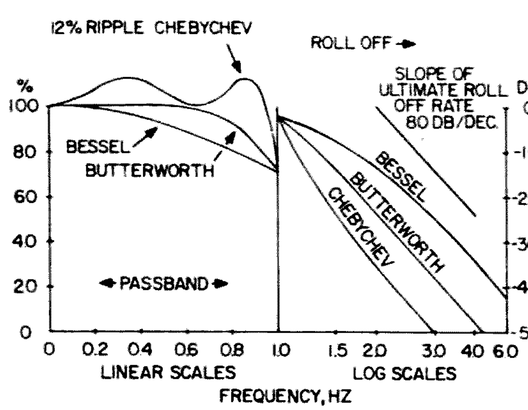


Fig. 2. 4 pole low pass response curves, 1 Hz cutoff.

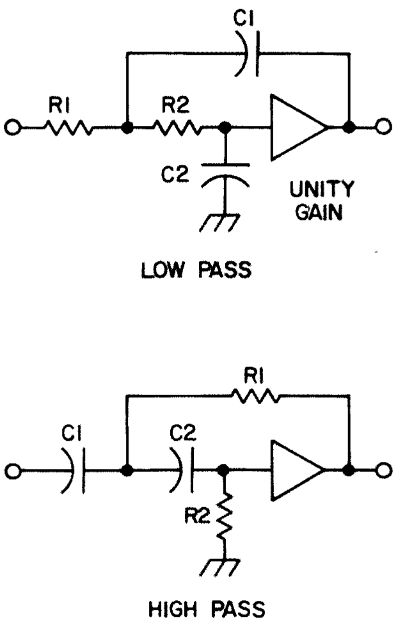


Fig. 3. Two pole sections.

Practically, the Butterworth response shape is the most generally useful so I shall describe its synthesis in detail.

Filters are made from two-pole (conjugate) sections, as shown in Fig. 3, connected in tandem. If the filter has an odd number of poles, a one-pole (simple) section, as shown in Fig. 4, is added in tandem to the rest. For a Butterworth filter, the cutoff frequency of each section is the same as the cutoff frequency of the entire filter. The component values for each section may be determined from the equations given in Fig. 5.

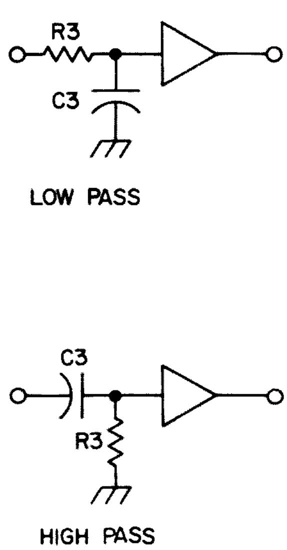


Fig. 4. One pole sections.

TABLE I

Frequency	**Response Vout/V2300 Hz**
2300 Hz	100%
2400	93.4%
2500	86.9%
2600	80.5%
2700	74.4%
2800	68.6%
2900	63.1%
3000	58.1%
3100	53.5%

Note that the equations for the two-pole section contain a coefficient, K1. This coefficient is determined for each two-pole section by the total number of poles in the filter. Values for K1 are listed in Table II for filters with up to seven poles. Note also that for a low pass two-pole section, the ratio of C1 to C2 must exceed a certain minimum value or the resistor equation yields negative values. The more accurate the resistors and capacitors used to build the filter, the more accurately the resulting filter will match the ideal characteristic. The equation for the

$$R_1 = \frac{K_1}{4\pi f_c C_2}\left[1 + \sqrt{1 - \frac{4C_2}{K_1{}^2 C_1}}\right]$$

$$R_2 = \frac{K_1}{4\pi f_c C_2}\left[1 - \sqrt{1 - \frac{4C_2}{K_1{}^2 C_1}}\right]$$

$$\frac{C_1}{C_2} \geqslant \frac{4}{K_1{}^2}$$

$$R_3 = \frac{1}{2\pi f_c C_3}$$ f_c is the cutoff frequency in hertz.

LOW PASS

$$R_1 = \frac{K_1}{2\pi f_c\ (C_1 + C_2)}$$

$$R_2 = \frac{C_1 + C_2}{2\pi f_c K_1 C_1 C_2}$$

$$R_3 = \frac{1}{2\pi f_c C_3}$$

HIGH PASS

Fig. 5. Component value equations.

$$\text{Response (Low pass)} \frac{V_{out}}{V_{in}} = \frac{1}{\sqrt{1+\left(\frac{f_{in}}{f_c}\right)^{2N}}}$$

Where f_{in} = input frequency
f_c = cutoff frequency
N = number of poles

For high pass response, interchange f_c with f_{in} in bracketed term thus:

$$\left(\frac{f_c}{f_{in}}\right)^{2N}$$

Fig. 6. Ideal response.

amplitude response of an ideal Butterworth filter with any number of poles is given in Fig. 6. Very good filters may be built by using measured capcacitor values in the resistor equations and selecting the nearest one-percent resistor value for use in the filter. Acceptable filters can be made using ordinary 5% resistors and 10% capacitors.

As an example, let's design the filter used in the converter. The cutoff frequency is to be 2300 Hz and three pole are required. This means a one-pole section and a two-pole section are needed. First, the one-pole section: Choose the capacitor value to give a reasonable resistor value (less than a megohm): Choose C3 equal to 0.0022 microfarad. Compute: R3 equals 31454Ω. Use 30 KΩ. (Note: In the converter, to get a section gain of 50%, a voltage divider was incorporated into the one-pole section, and R3 is effectively in parallel with R4.) For the two pole section, refer to Table II to find the coefficient: K1 equals 1.000 (How nice!). Compute the minimum C1 to C2 ratio: Ratio equals 4:1. Choose C1 and C2

TABLE II

Filter Number of Poles	Two-Pole Section No. 1	No. 2	No. 3
1	x	x	x
2	1.4142	x	x
3	1.000	x	x
4	1.8478	0.7654	x
5	1.6180	0.6180	x
6	1.9319	1.4142	0.5176
7	1.8019	1.2470	0.4450

Odd number of poles have simple one pole section added.

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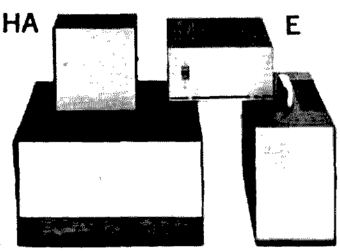

Model	Dimensions	Resale Net
"E"	6½ x 3 15/32 x 7 1/16	8.25
"HA"	5⅛ x 5½ x 4 (Blank Panel)	8.95
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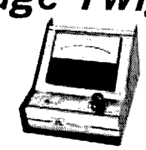

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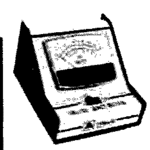

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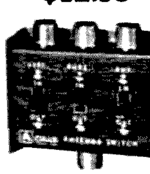

450X-S Antenna Switch
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700X-2 KW Wattmeter
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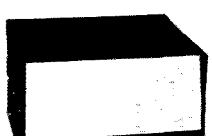

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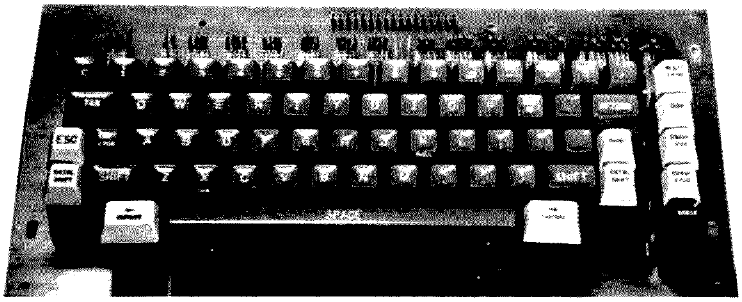

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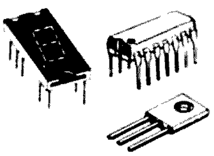

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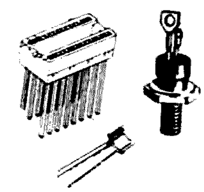

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accordingly (also, to keep the resistor values reasonable): C1 equals 0.1 μF. Compute R1 and R2: R1 equals 2118Ω and R2 equals 1028Ω. Use 2.2K and 1 KΩ. That's all there is to it! In most cases, the capacitor values (and ratio) can be juggled around to produce "nice" resistor value. In the case of low pass filters, where dc response is critical, the capacitor values should be selected to make the resistor values as small as possible to minimize the offset voltage created by the op amp bias current. Also, section inputs must be driven from low impedance sources, such as the output of an op amp, for best performance.

Tuneup and Conclusion

With a scope connected to the appropriate tuning indicator filter output, apply the proper input frequency (2300 or 3100 Hz) to the converter, and tune the filter for maximum deflection. Apply a small input signal and, with the scope connected to the limiter output, adjust the limiter sensitivity pot for the most symmetrical (50% duty cycle) squarewave limiter output. Finally, adjust the output level pot for the desired output level. For the RD-92A, this is done with a 3100 Hz signal input (white) and the output level is adjusted downward until the machine just stops writing (a black line). To operate, connect the converter to a receiver and tune in a FAX signal (usually USB) just as you would an RTTY signal: with the cross pattern on the tuning indicator scope. Then, wait for a phasing sequence, phase up your machine, push the "on" button, and go.

I have received 120 RPM 48 LPI maps from NPM, Hawaii (9440 and 13862.5 kHz), JMH, Tokyo (7305 and 13597 kHz), NSS, Washington, D.C. (8080 kHz), and many others. I have received pictures from AP on about 15989 kHz and UPI on about 15787 kHz (both LSB). Quality has been good. The maps come in twice because my machine runs at 60 RPM and 96 LIP. The pictures are sent at 60 RPM but not 96 LIP so they come out squashed. It's been fun. If your equipment doesn't use the 2300–3100 Hz range, redesign the low pass filter. It's easy. Now, if I could only find a Facsimile Transmitter . . .

. . .K6LJY/7

Ladimer S. Nagurney WA3EEC/1
Department of Physics
Brown University
Providence RI 02912

A SIMPLE TOUCHTONE PAD FOR AUTOPATCH

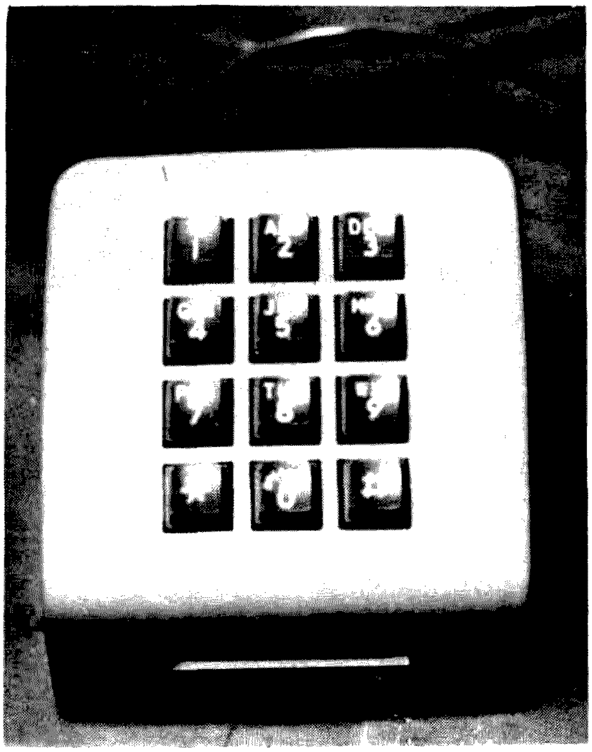
The Western Electric Model 1035C3 can be converted simply and inexpensively – it looks good too!

The Model 1035C3A Western Electric Touchtone Pad with case is becoming available to many amateurs. While recently there have been many complicated circuits for hooking up Touchtone pads, this pad needs almost no work to produce respectable tones. Further, it comes in a nice case and will immediately become XYL-approved. It's also small enough to be put into the glove compartment of a car and kept there for instant use.

The pad is designed for computer terminal use. A typical application is in a PBX where normal dial phones are used, but touchtone signals are needed. It is connected to the phone by a 14-conductor cable coming out the rear.

Conversion

This unit is easy to convert. First, remove the cover by carefully removing the two screws. The pad, a 35C3A, can be removed by loosening the two screws on each side of the pad and prying the bracket slightly apart. The cable to the phone is then removed and discarded.



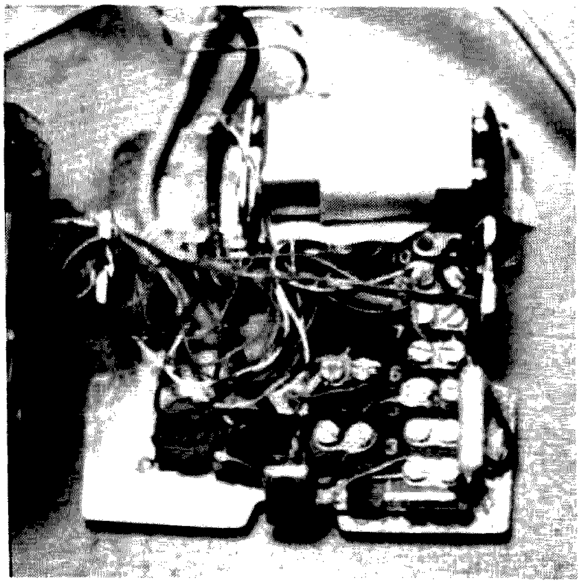
One will then see a large terminal board on the right side and a small printed circuit board with several resistors and a transistor in the upper corner. Remove the small printed circuit board and discard.

At this point one will have only the black terminal board left on the base. Remove all the wires from this board. Now hook up the external components as in Fig. 1. The pot is a small PC type with solder lugs soldered to its ends and a wire to its wiper. It is insulated with electrical tape and mounted to the lower left of the board.

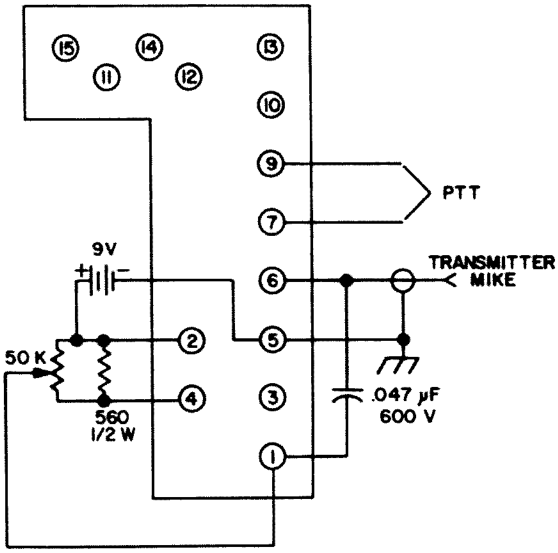
The wires from the pad are installed as in the Table. The pin numbers are those on the original strip. Tape over the top part of the board with two layers of electrical tape and use more tape to mount a 9V battery.

There is enough room just above the cord slot on the rear of the case to mount a mike jack. The plastic is easy to drill if one uses a knife point to make a starter hole and then drills carefully. Remember to clean your drill bits with alcohol before drilling to remove any oil left on the bits from drilling metal.

My connector hole was made with a chassis punch. So as not to deform the plastic, the punch was removed and rotated several times during the punching operation. With a little care a clean hole can be easily punched. After punching I washed the case with warm water and Ivory Snow to clean it.



Internal view of the converted unit.



Pin	Color of Wire
5	Orange/black and blue
7	Green/white
9	Violet
4	Green
11	Blue/white
12	Red/green and black
13	Orange
14	White
15	Red

Fig. 1. Hook-up of external components.

Connecting the Unit

A three foot shielded cord is used to connect the pad to the transceiver. The mike can then be plugged into the jack on the pad assembly. There are two terminals for the PTT leads, so it is immaterial which system your transceiver uses for keying. If one PTT lead is grounded you can connect terminal 5 to one of the PTT terminals. Thus by pushing any button your transmitter will automatically be keyed.

The pot must be set so that the output of the pad is about the same level as your mike. This can be done with a deviation meter or more crudely by someone listening to your direct signal.

Conclusion

This pad is simple to convert and allows the use of many autopatches. One call to the authorities during an emergency will repay in satisfaction its cost by a hundredfold. One warning should be mentioned. Do not use the autopatch for general use unless you are a member of the repeater group that runs the autopatch. This will elminate many hard feelings. Good luck and good patching.

. . .WA3EEC/1

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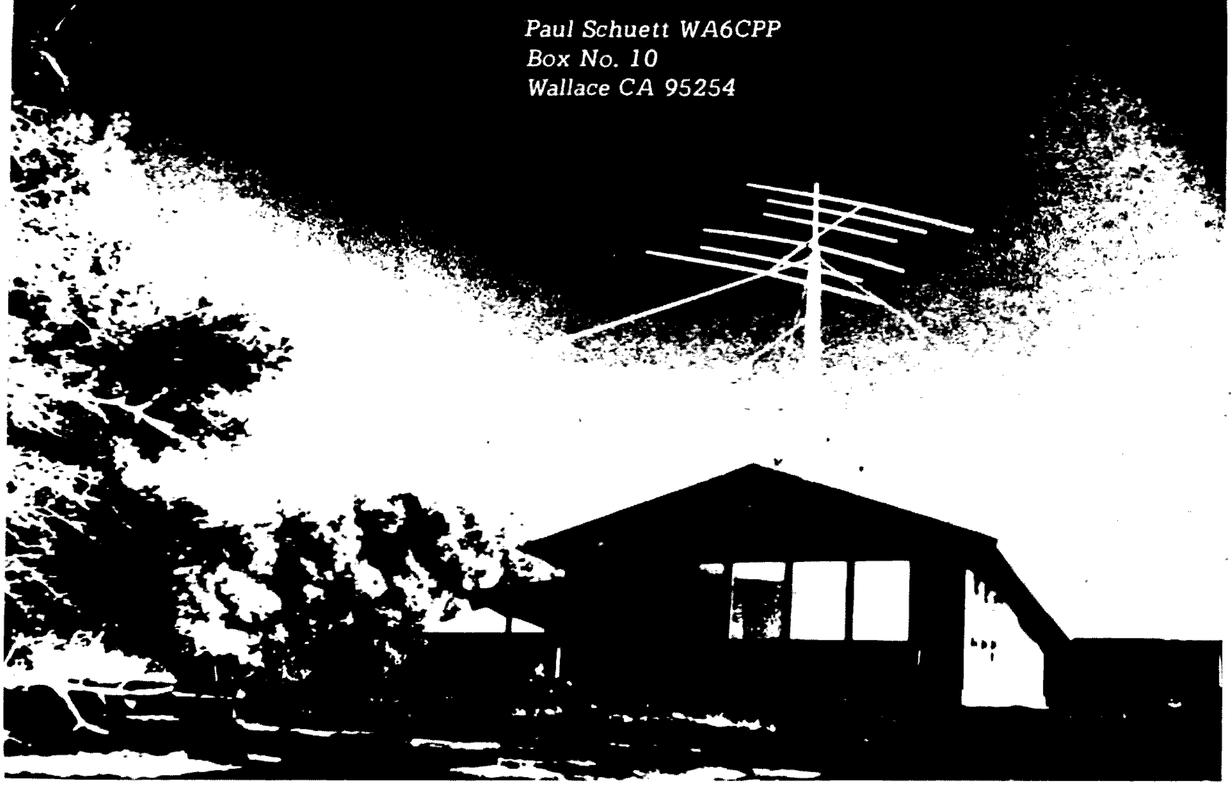


Actually, the $1,000 is a conservative estimate – there were a few hidden costs mixed in with other expenses; some of the materials were used at the former QTH, and the money previously spent. Had I known the fuss and bother this project was going to be, I would have purchased a commercially-built 40-meter beam and a second tower. But that's getting ahead of things.

The XYL was making suggestions for building a new home – our "dream house" where all corners would be square and she would have a large, fully-equipped kitchen. I wasn't thinking so much about the kitchen as the ham shack, where there would be adequate space, plenty of heat (the old operating room in the garage was fine, but lacked a few conveniences), lots of electric outlets, and close to modern plumbing. We (she) designed a place exactly suited to our specifications and found the ideal building site – 5½ acres on top of a small hill in a rural setting about 40 minutes of driving time from work. We found a builder, signed a few papers, and construction was under way.

Since construction of a new place always takes time, even more time than you at first expect, there is plenty of time to plan an antenna system. The house is situated on top of the hill overlooking a small lake; the highest point for about a mile in any direction. The XYL concentrated on most of the details; I concentrated on the ham shack and antenna system. The contractor was most cooperative in matching everything to our specifications. The ham shack has an outside entrance; is just across the hall from the bathroom, and through one wall is the garage so that antenna wires can get outside conveniently. The walls are soundproofed so I can work contests or chase DX all night without keeping everybody up. In addition to some cellotex between the outside sheetrock, the walls are filled with fiberglass insulation. A 220V line comes in from the main electric service with breakers for the linear outlet (220) and the equipment outlets (110) as well as the rest of the lights and outlets. A separate 220V breaker is included to control a yard light to be installed on the tower. The yard light will be a "luminaire," one of those mercury-vapor fixtures. In case of RFI, I can cut it off.

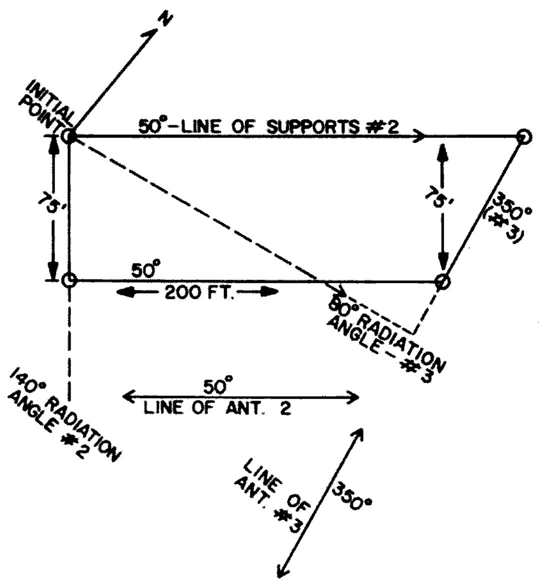


Fig. 1. The arrangement of antenna supports for the system.

Because of the design of the house, I could not locate the tower just outside the shack, so it had to go on the other side of the house. I was fortunate enough to meet a fellow who works for the power comany and who studies engineering at college – he wants to work for the local electric company in the high-tension department. He has had considerable experience up in the air and has all the equipment – safety belts, special shoes, and all this other stuff – that is needed. He agreed to construct the system for a small stipend. I can honestly say that without him and another fellow, WB6QQF, this whole thing would never have gotten off the ground.

While title to the land was being cleared, I had ample time to consult many antenna reference books to get exactly the system that would do the best job for me. I figured the beam would take care of 20, 15 and 10; I'd use the folded dipole on 75 (I hardly ever use that band except for a few local contacts and an occasional contest), but for 40, I'd do something special. I get quite active on WCARS (7255) during the summers in the daytime; in the winter I enjoy working 40 at night when the long skip comes in. Analyzing the signals that come in first from the east, I noticed that the fellows with the big antennas come in first, are loudest, and stay in the most. I wanted a big antenna, too.

The two most useful books I found are the ARRL Antenna Book and the B&E Radio Handbook. I wanted something that would work well NW-SE for WCARS and general daytime operation (nothing comes in from the Pacific except for an occasional ship at sea; there are just a handful of stations that come in from Nevada and Utah, with an occasional Idaho, Wyoming or Montana, so there is not much need for putting a signal where there are so few contacts); and something to go east for nighttime operation (we hear a few KH6's and a lot of foreign QRM at night, so no need to worry about much from that direction). The final system design was a combination of several good ideas seen in several sources – I have not seen this system described anywhere so maybe I can call it the "CPP Phased Array," or something like that.

The system is made up of three separate antennas on common supports. #1 is an ordinary dipole. #2 is the NW-SE array, consisting of two collinear pairs ½ wavelength apart and #3 is a two-element array for contacts east.

I decided to support this system on four telephone poles. The first step is to orient the antenna so the signal will go in the proper direction. With a large globe and a spherical protractor, I measured the angle for the main axis of the antennas. The #2 goes right down the San Joaquin Valley to Los Angeles; the other way should be good for contacting Alaska. Of course, the beam won't be so thin that I won't be able to do well in Washington and Idaho. The #3 I aimed on a great circle to come out about on the Virginia-North Carolina state line at the Atlantic Ocean, figuring the beam will be sufficiently broad to make almost any contact toward the east. The angles of the main

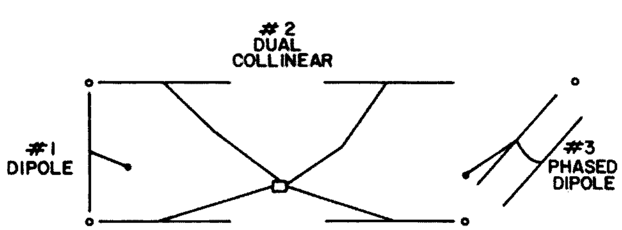
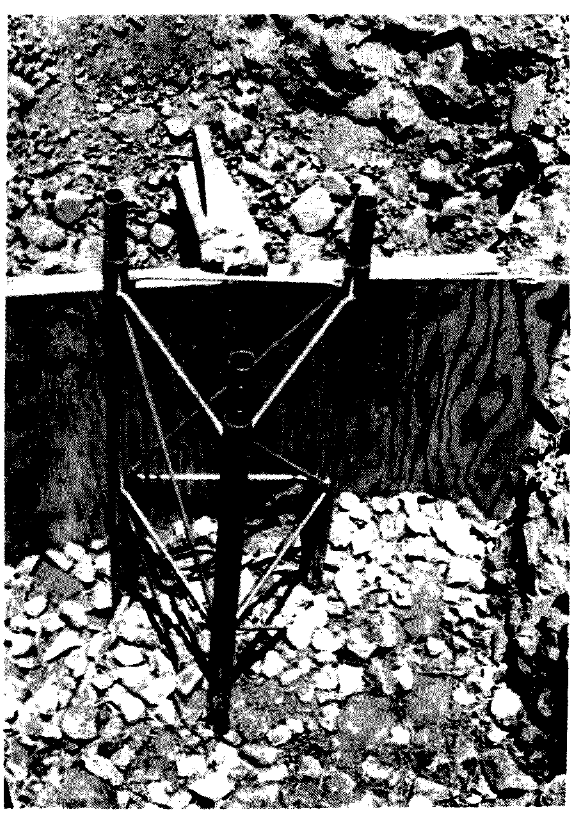


Fig. 2. The three antennas as they are strung between the supports.

lobes worked out to be about 80° and 140° using my rough equipment.

To get the azimuth of the supporting structures, subtract 90° (assuming you're planning a broadside radiation pattern), and determine where on the ground your supports will go. My measurements came to -10° or 350°, and 50°. Check a topographic map at your local library (at 75¢ these are getting too expensive to buy) for compass deviation from true north. Plot true north using a couple of stakes, adding or subtracting the compass correction. You might set these up at night, aiming toward the North Star – if you don't know where it is, ask any Boy Scout!

Assuming you have established the north line at your first point, use your transit (or a quite large protractor) and a long tape measure, preferably metal, to set up your system. Be sure to check everything several times – if you're measuring a rectangle, make sure adjacent sides are equal in length so your angles will be 90° (remember that high school geometry?).



Tower base set in place with gravel and rocks at bottom to facilitate drainage. The entire hole was then filled with concrete and base section made plumb before concrete set.

View of irrigation trenches before antenna construction started.

The supports on this installation are arranged in a trapezoid and came out something like Fig. 1.

A diagram of the elements between the supports looks like Fig. 2.

A study of each antenna by itself shows #1 to be a simple dipole. This was the one I used for many years at the old QTH. There is a 1:1 balun at the feed point fed by 75Ω coax.

The #2 antenna, designed for NW-SE, is the most complex. This consists of two collinear systems back-to-back; or maybe two back-to-back systems collinear. Each element is meticulously made precisely the same length – I chose 7225 kHz as the design frequency, since that is the center of the phone band. The phasing is accomplished in the feed lines – the lines feeding a collinear pair must be *exactly* the same length; the lines to the other pair must be *exactly* ½ wavelength different. The idea is to have each collinear pair in phase with each other, but the two pairs spaced ½ wavelength apart and phased 180°. I roughly figure there should be around 6 dB gain out of this configuration.

Notice that all elements are fed in parallel at the common point. I constructed the elements from 300Ω line (Belden #8235) and the feed line from the same stuff. Four 300Ω impedances connected in parallel should result in a 75Ω common point, so a 1:1 balun fed by 75Ω coax fills the bill.

Antenna #3 is an end-fire array. The elements are spaced 1/8 wavelength and phased 135°. These figures were obtained from a chart showing spacing, phasing, and the resultant patterns. The active elements

Plastic pipe in trench containing feed coax and antenna switch wire.

are 3-wire dipoles with the center conductor twice the size of the outside conductors, resulting in a 600Ω feed point. Two 600Ω impedances in parallel results in a 300Ω system; a 4:1 balun nicely matches 75Ω coax. I used #14 wire for the center conductor and #20 wire for the outside conductors. For spacers, I used some scrap lumber cut 15 cm long, drilled for the wire, and boiled in paraffin. Commercially-made porcelain or ceramic spacers are available. A person looking at the chart could choose a variety of spacings and phasings to get the approximate pattern. This one does not give a sharp beam, but puts minimum sensitivity to the rear, which will eliminate the foreign QRM from the west that comes in over the Pacific. I wanted a fairly broad beam since this array is non-rotatable.

The design frequency for all antennas is 7225 kHz. To make this for any frequency, use the standard formulas

If you make your folded dipole out of 300Ω line, be sure to short the conductors together a distance from the feed point equal to the velocity factor of the line. The Belden line is 77% velocity, so 77% of a wavelength in free space, short the wires. This little fact comes from the Radio Handbook.

This system uses about 230 meters of 300Ω line, 190 meters of 75Ω coax, and about 125 meters of other wire. In addition, I used about 450 meters of ¼ inch (Std) nylon rope as spacers and supports.

Now, with all the necessary facts and figures, I was ready to start construction. The first thing is to get the supports. There is a telephone-pole place that cheerfully sold me four 12m high poles at \$65 each. I should have stopped right there and put up another tower and a 40-meter beam – it would have been cheaper and easier. But I had my heart set on that figure eight pattern and the prestige of having a phased array (a beam is so pedestrian).

After the \$260 plus tax for the poles, it was another \$50 to have them delivered to the site. I wanted to get the power company to set them in while they did their own setting in the area, but I missed them. It cost another \$100 to get a setting rig in there. After all this, we picked up some pole hardware and set in back guys and anchors. Each anchor is in about a yard of concrete. Two pulleys are at the top of each pole so that the antennas can be pulled into position from the ground.

The coax is buried from the shack to the antenna feed point. The contractor had a man with a backhoe doing some work, so he dug trenches for an irrigation system at the same time. We shared the irrigation trenches with the coax. To simplify any later requirements, I fed the coax through 1" (Std) plastic water pipe. Where the feed line connects to an antenna connection, the plastic pipe connects to a 90° PVC bend and a length of 1" (Std) conduit terminated at an electrical box. This material is instantly available at any electrical emporium. The plastic pipe came from an irrigation supply firm.

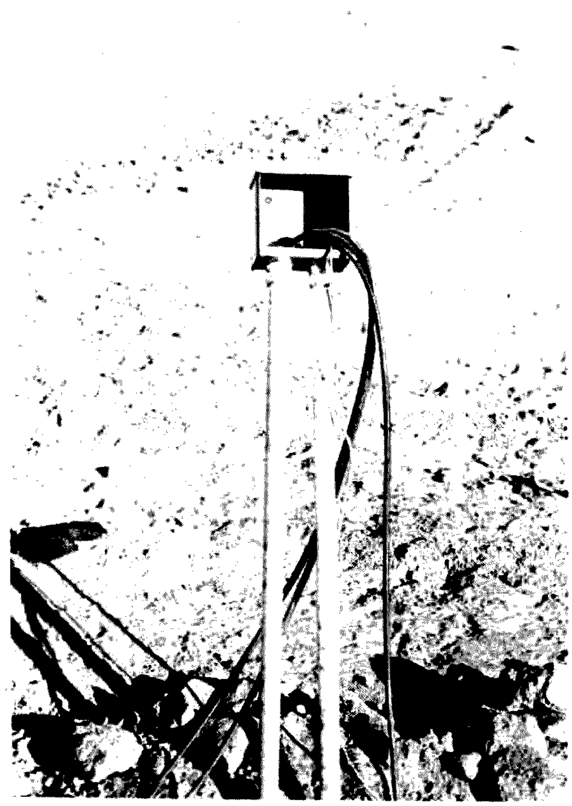
Only one feed line leaves the shack for the three antennas. A remote-control coax switch is installed at the first cutout. This 3-position switch operates on 27V dc supplied from the shack. A little power supply

and 3-position switch selects the antenna to be used, the others grounded. The switch is connected to the power supply by a run of 4-conductor cable going through the plastic pipe. Belden 8444 was used for this application. The switch is made by Dow Key; it took awhile between order and delivery, but they did send an apology for the "abysmal service."

After all the fuss on the phased array, we didn't think too much about the tower. This was installed in the standard way, placing the base section in a hole with some gravel in the bottom, then putting in the better part of a yard of concrete. Guy anchors were prepared according to specifications building up a little cage with reinforcing bars and using about a yard of concrete per anchor. One of the guys came down close to the front door, so a 3m high post was obtained from the telephone pole place, guys brought to this, and from here to an anchor. Nobody will knock his hat off on the guy wires! Each anchor is grounded with a ground rod. The top guy wire is broken up into non-resonant sections with egg insulators. The tower base is grounded with some #6 copper wire buried in a trench. Lightning arrestors are installed on the antenna coax at the bottom of the tower and at antenna feed points on the phased array.

The tower is a Rohn #25 with the usual accessories. I purchased this through my favorite supplier, but picked it up at the Rohn warehouse in Reno. This saves a bundle on shipping, and being an out-of-state sale, saved a few pennies on sales tax as well! My installer handled the antenna rigging in the regular way, except that he left the driven elements off the beam to facilitate attaching the antenna to the mast. These elements were installed last.

All this would have been wasted effort if the system didn't work. To test the tower, I checked into the County Hunters' net on 14336 to activate Calaveras County, and made about forty contacts in every call district using the mobile rig transceiver. Then we QSY'd to 15 meters and contacted Japan, who gave a 5–9+ report and said it sounded like I was using a full kilowatt (the mobile is a Swan 270). There was no significant activity on 10 meters. The swr



Housing for antenna coax switch.

was quite satisfactory except on 20 where the resonant frequency was a bit low; we will shorten the driven element almost 0.5 cm to compensate for this.

We temporarily connected the phased array and found the resonant frequency was a bit higher than expected, although on making a permanent connection we may eliminate some of the capacitance in the feed lines and lower the resonant point. There has not yet been sufficient time to evaluate the results, but the reports were good in the expected direction and the swr was no greater than 1.25:1 at the band edges. I have some plastic pipe left over from the irrigation job and am feeding the 300Ω line for 40-meter antenna #2 through this, attaching it to some fence posts. It will be about 1½ meters off the ground.

This is going to be a fine antenna system. Now that most of the frustrations are over, I'm glad I have it going. It is a matter of speculation as to what results would have been had I installed a second tower and beam. Maybe when I have some surplus cash I'll try it.

. . .WA6CPP

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SPECIAL CONSIDERATIONS FOR DIGITAL DESIGN

Avert problems at the drawing board

Noise, crosstalk and spurious signals have always been a problem in electronics, and with the many new digital integrated circuits appearing on the market, it is imperative that everyone understand the practical aspects of digital design. There are special considerations to be aware of before the schematic is drawn up, and additional care is necessary in laying out a breadboard or printed circuit board.

Problems Generated by ICs

The ICs themselves produce numerous transients. Clock generators, comparators, multi's, lamp drivers, counters and decoders are all switching at various speeds and times producing pulses and spikes. Refer to Fig. 1. Suppose gate IC1 is supplying pulses to counter IC2. Gate IC3 supplies signals to IC4. Capacitor C represents the distributed coupling capacitances between printed circuit tracks (or wires) A and B. Assuming a pulse with a fast rise time is fed into gate IC3, IC3 will probably switch at a very fast rate (nanoseconds) and send the pulse along track B to IC4. Depending on the value of C, a certain portion of this pulse will be transferred to track A. This disturbance may cause IC2 to erroneously change state. This possibility is determined by the proximity of track A to track B, the noise immunity of IC2, the width and height of the pulse and the source impedance of IC1. Naturally it is important to separate tracks which may cuuse crosstalk problems. Since capacitances within IC2 will have to be charged (or discharged) before IC2 can change state, the

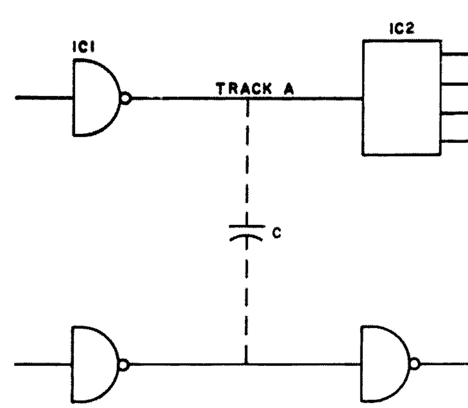

Fig. 1. Crosstalk interference.

question is largely one of energy (and thus the importance of the pulse height and width). If IC1 has a low output impedance the interfering signal may not be able to develop much voltage on track A. Generally speaking TTL (transistor-transistor logic) has a lower output Z than DTL (diode-transistor logic) or RTL (resistor-transistor logic). This

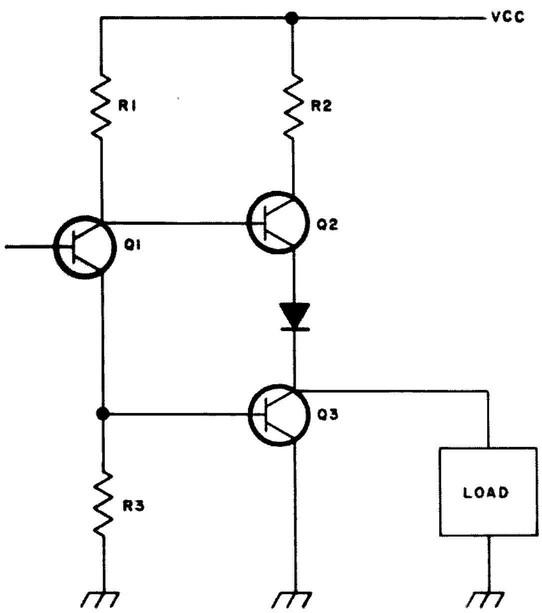

Fig. 2a. Typical TTL output stage.

is because of the active pull-up transistor in the output of the TTL. See Fig. 2a and 2b. Incidentally, it can now be easily seen why TLL is the higher speed logic. In Fig. 2b when Q1 cuts off it may take quite some time for R4 to charge a capacitive load to Vcc, whereas in Fig. 2a, Q3 cuts off and Q2 saturates, charging the load rapidly (naturally R2 is much smaller than R4).

Make no mistake, TTL does have its disadvantages. It is more expensive and usually is less immune to noise (since it can switch faster). And don't forget that it requires more power to switch at high speeds since the stored charges must be moved faster. The pull-up transistor also causes a problem. For a small portion of the switching period both output transistors are con-

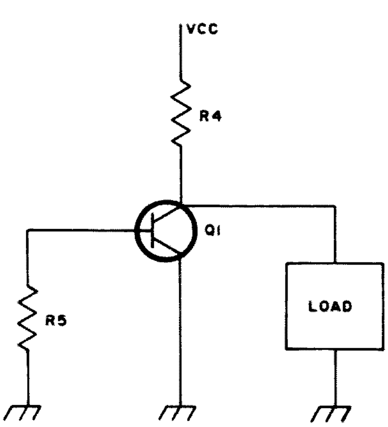

Fig. 2b. Typical DTL & RTL output stage.

ducting. This demands extra current momentarily from the power supply (this could put transients on the supply line).

Throughout this entire discussion it is becoming obvious that attention to practical details is mandatory. The power supply should be well regulated and also must have a low impedance at rf frequencies. Many electrolytic capacitors are nearly dead shorts at audio frequencies but have enough inductance at radio frequencies to render them completely ineffective. It is then necessary to bypass the supply line to ground with a .01 or .001 μF disc. At high switching speeds a printed circuit track several inches long may represent a substantial inductance. Lead lengths must be kept short. Tracks or wires carrying substantial currents should be made as heavy as is practical. The ground system is important. Do not string long grounds all around the pc board like a coil. Small disc capacitors may be needed at various spots on the board to bypass noise signals.

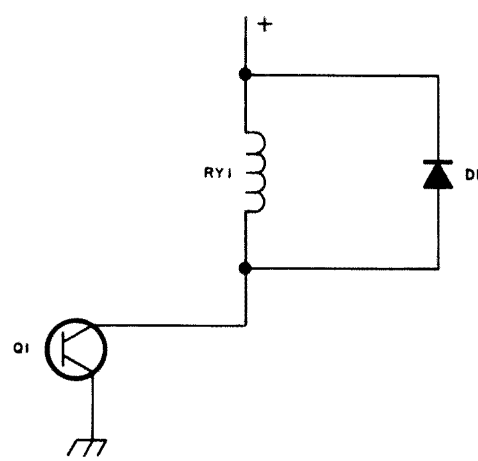

Fig. 3a. Diode noise suppression for dc circuit.

How Adjacent Circuits Affect Digital ICs

Often the most difficult problem to overcome is operating digital ICs in close proximity to electro-mechanical devices or interfacing with them. Relays, solenoids, switches and motors can play havoc with digital circuits. The author is familiar with a number of specific problems:

1. Relays and solenoids exhibit the characteristic inductive kick when they are deenergized. See Fig. 3a. If the coil runs on dc, a diode D1 will protect Q1 and suppress the

rf noise. Note however, that when Q1 cuts off, current will continue to flow from RY1 but now through D1. This means that RY1 will not drop out quite as fast as without the diode. It may be possible in some cases to achieve proper spike suppression and fast relay dropout by placing a resistor in series with D1 (try 1 KΩ as a starter, then work from there). In Fig. 3b, an ac relay is shunted with a non polarized capacitor (try from .1 to several microfarads). A bi-directional suppressor diode helps too.

2. Switching high current can cause rf fields and power line transients. It may be necessary to turn these currents on and off over a period of milliseconds or seconds rather than use the microsecond response of a relay or switch.

3. High voltage is a nemesis. A spark gap or even a corona discharge is a dandy rf source. Your counter, computer, etc. may be influenced by the electrostatic precipitator or neon sign in the next room. A generous application of corona dope may be a cure. Rf shielding can be a help.

4. Using switches and relays as inputs for digital ICs can pose special problems. Suppose a microswitch (or even a photocell driving a relay) is counting packages coming from a high speed production line. This switch drives a digital counter. Even if it is a slow counter it will probably still have a microsecond switching time. This is fine except that a switch or relay never really

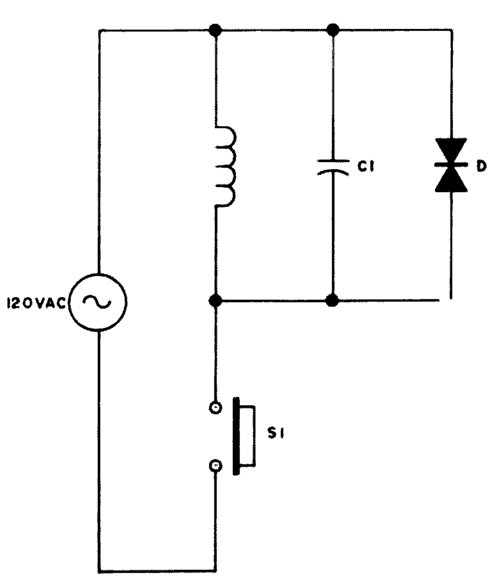

Fig. 3b. Suppression on an ac circuit.

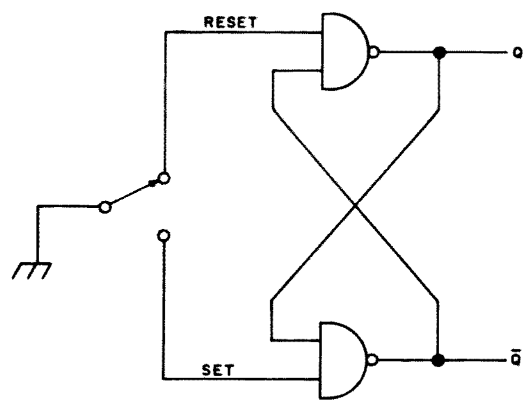

Fig. 4. RS latch; for output use either Q or Q̄.

closes immediately when activated. It bounces quite a bit, sometimes for a millisecond or more. So for one input, a switch or relay may produce ten or 100 outputs or more. One standard solution for this problem is to drive the switch into an RS latch (flip-flop). See Fig. 4. This prevents the bounce from being transmitted to the counter. Another approach would be to use a photocell with a solid state relay (a transistor switch). That is, eliminate the use of a mechanical switch altogether. Of course the frequency response of any transducer that you use may have to be quite high since some digital ICs require a very fast input (quick rise time or fall time) pulse for reliable triggering.

Summary

If your digital circuit does not operate as expected your diligence as a troubleshooter will be tested. However, consider these ideas:

1. A simple change in lead dress may be all that is needed.

2. Be careful in using an oscilloscope to find transients. The capacity of the scope probe to the circuit board may be all that is needed to pick up the interference. The noise may be on the power supply line, but you may pick it up no matter where you put the probe.

3. You may ultimately decide that in your particular application it would have been simpler to use relay switching instead of ICs (isn't that a revolting thought?).

...K3VKC

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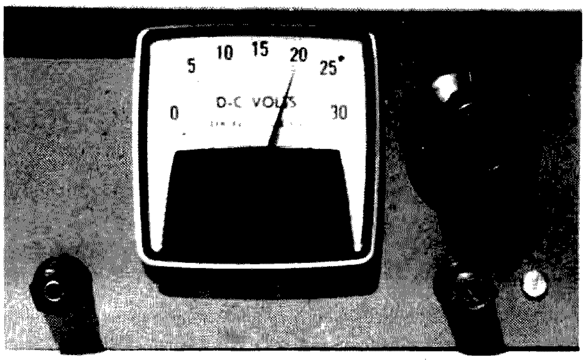

SELECTABLE VOLTAGE POWER SUPPLY

Sooner or later every experimenter reaches the point when the cost of buying batteries for his solid state projects exceeds the cost of building a line powered power supply. This project is intended to fit into the point in his experience where he has had some success building things and is ready for a project that will become a permanent part of his collection of test equipment.

Figure 1 shows a simple bridge rectifier power supply with a two transistor shunt regulator. The transformer and diodes supply the voltage which is regulated by the two transistor plus diodes circuit. The regulator performs the function of a simple zener or VR tube regulator. The regulator has a constant voltage drop across it, and any voltage in excess of that specific voltage drop will be shorted to ground through the two transistors. Q1 takes the majority of the load when it is holding the voltage down. The internal resistance of the diodes and the transformer allow this "shorting out" of the power supply. The operation of the regulator itself is quite simple. The diodes have a constant voltage drop across them and they are in series with the resistor across the power supply. Since the diode voltage is constant any change in the voltage across the power supply will appear directly across the resistor. Note that the resistor is also directly across the base-emitter junctions of the two transistors. The voltage across the resistor is the bias voltage for the transistors. As the power supply voltage increases, the bias voltage increases. With increase in the bias, the transistors, notably Q1, conduct more current. This increase in current tends to "short out" the power supply voltage to lower it to the regulation voltage. A decrease in output voltage decreases the conduction through Q1 and tends to increase the output voltage in response to the decrease. The diodes determine the regulating voltage. The output voltage will be the diode breakdown voltage plus the approximately 1.4 volt drop across the two forward biased transistor junctions. This points out the reason for all the diodes in addition to D1.

Switching in different zener diodes would be the obvious way to select voltages, but zener diodes are expensive and the inexpensive ones can vary by as much as a few volts of their marked value. Almost every experimenter has a handful of small glass signal or switching diodes that he got in a bargain package, and later found that he had no use for them. These diodes are added in series with D1, but in the forward biased direction. This takes advantage of the forward biased voltage drop of 0.2 volts for a germanium junction and 0.7 volts for a silicon junction. Note that the zener is in its reverse breakdown mode providing the lowest fixed regulation voltage while the other diodes

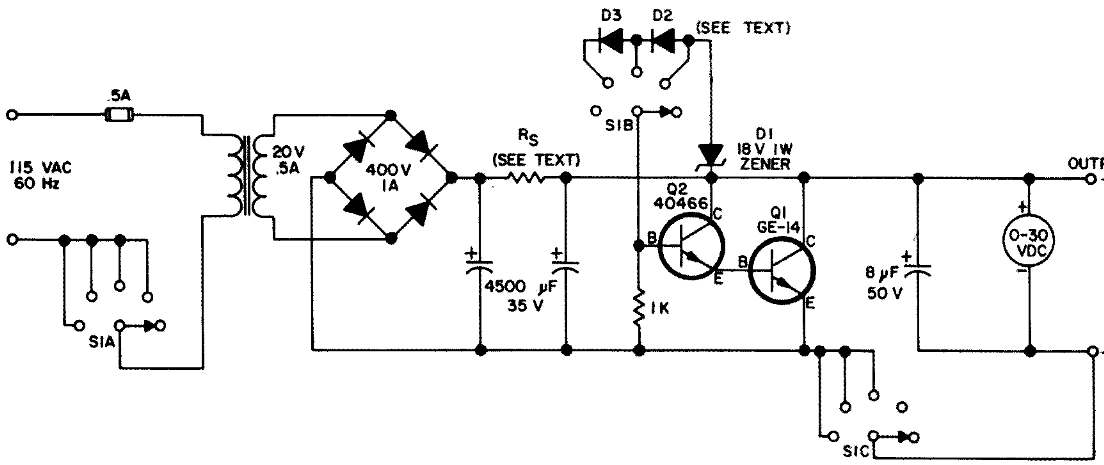

Fig. 1. Schematic diagram. F1 = 0.5 amp line fuse; T = 115 VAC primary, 20 VAC secondary at 0.5A; D1 = 18V 1W zener; D2,D3 = small diode combinations; D4–D7 = 400V 1A rectifier diodes; Rs = series current setting resistor; S1 = AC 3 pole, 5 position rotary switch; M = 0–30V voltmeter; Q1 = GE-14 transistor; Q2 = 40466 transistor.

provide additional switchable increments. Just use lots of diodes and a big switch.

Construction

The construction is non-critical and the parts can be assembled in almost any manner. The only critical component is Q1. This transistor dissipates the entire power that is "shorted out" in the regulation process. The power must be dissipated as heat, which requires a good heat sink. In this case the transistors were bolted to the largest piece of metal available; the chassis. Almost any silicon power transistor can be used for Q2, so long as it has about a 60 volt rating. Q1 must have about a 25 watt power rating, a 60 volt voltage rating, and handle about 4 amps. These ratings are conservative, of course, to allow for transient problems and endurance under high temperatures. The ratings of the transistor used are actually much greater, since the increase in cost was nominal. A one watt zener was used because it was available, but a few hundred milliwatts should be adequate. The small diodes can be selected by experiment to determine type and amount of them necessary to obtain the voltages desired.

Operation

Setting the power supply up for operation is just a matter of selecting voltages by trying different combinations of diodes and setting current by adjusting the series resistance for maximum current without overheating Q1. Q1 will normally run quite hot, particularly in the lower voltage ranges where the regulator works the hardest. If a higher voltage transformer is used, Q1 is too hot, or lower voltages are desired, a dropping resistor will be necessary. The resistor can be about 10–100Ω, depending upon the parts used. The parts used as shown in the schematic gave the following results:

Switch Position	1	2	3	4
Voltage	18V	20V	23V	25V
Current	500 Ma	400 Ma	300 Ma	100 Ma (no regulation)

The current readings were made for a one percent drop in output voltage as the load was increased. The ripple in the worst case was about one percent. One unusual feature is that the chassis is connected to the positive B+ lead. This is because the transistors were bolted to the chassis without the insulating mica spacer and the necessary silicon grease. The chassis really should be grounded, but I don't expect any troubles.

Conclusion

This power supply was built out of junk box components in one evening. The builder should use the schematic as a guide to use whatever parts he has available to experiment to build a power supply to obtain whatever voltages he desires. This project is not difficult and will make a very useful "first project" for the experimenter to gain experience as well as power for his future experiments and projects.

. . .WB6BIH

THREE WAVELENGTH LOOP FOR 20m

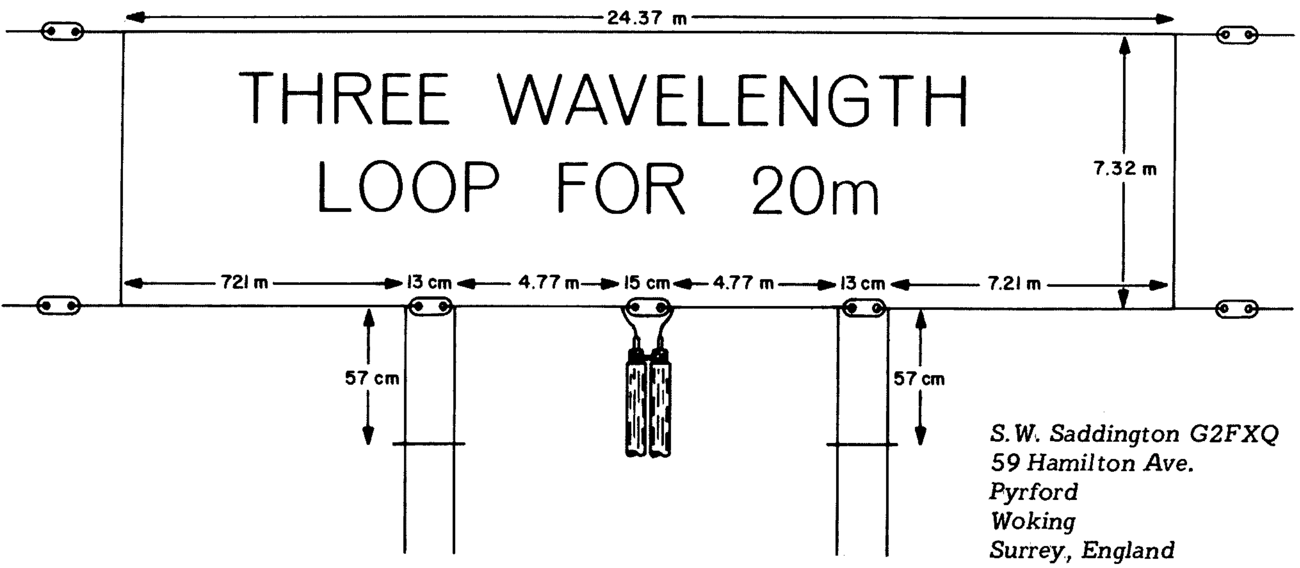

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Fig. 1. Three wavelength loop antenna for 20 meters. All measurements are metric.

The three wavelength loop antenna is no substitute for a carefully constructed and well elevated cubical quad or three element beam, but it is simple to make, easy to adjust, and does provide a valuable measure of that all important low angle radiation. It also has a more or less all-round radiation pattern and therefore needs neither tower nor rotating gear.

The dimensions of the antenna in meters, as I erected it, are shown in Fig. 2. The two stubs, positioned approximately at voltage antinodes, are for tuning purposes, and should be adjusted equally for mid-band resonance. This is done in the normal way, with a grid dip oscillator at the feed point, before the λ/4 transformer and line are attached.

Figure 1 shows the shape of the antenna in its vertical plane, and its dimensions in terms of wavelength. By feeding it with a low impedance line at point "x," voltage maxima occur at points marked "A" and "B,' these two letters signifying opposite phase. There are thus, in effect, two 1½λ wires which are in phase, and stacked λ/3 apart. The impedance at point "x" is 130Ω a value which can be conveniently matched to a 75Ω line by a 100Ω λ/4 transformer. In my case this λ/4 transformer is made from two λ/4 lengths of 500Ω coaxial cable connected in series. My version of the antenna is also fitted with a λ/4 balun to reduce radiation from the 75Ω coaxial line, but this is a refinement which could be omitted.

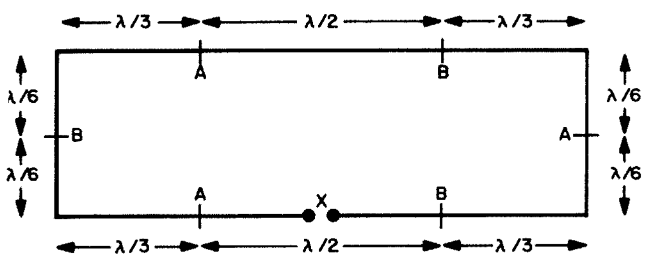


Fig. 2. The same antenna expressed in terms of wavelength as an aid in adapting the design to other bands.

Using the matching system described, the SWR achieved was 1/1.04 at mid-band and 1/1.08 at the band edges.

The theoretical gain of the antenna is about 4 dB (1 dB for the overall length of 1½λ plus 3 dB for the λ/3 stacking). This is not a particularly impressive figure, but you may judge for yourself whether or not the antenna is worth a trail. With a power input of 200 watts PEP, stations from all hemispheres were contacted with a minimum signal report of S5. Some stations worked were: HR2(S5), ZM3(S6), 5NZ(S7), 4 x 4(S7), ZLI(S7), EP2(S8), JA6(S8), CR6(S2), PY4(S2) 6Y5(S9+). All these contacts were during a six month period of random operation.

The height of the antenna used for the tests was 5 meters, and its position (near London) was roughly ENE/WSW. The horizontal radiation pattern is apparently the same as in the case of a single 1½λ wire.

. . .G2FXQ

A VISIT TO REGENCY

Picture Story by Wayne Green W2NSD/1

On the way out to the Dayton Hamvention Keith W7DXX and I stopped over for a day in Indianapolis to visit the Regency plant and see the new HR2B and HR220 rigs.

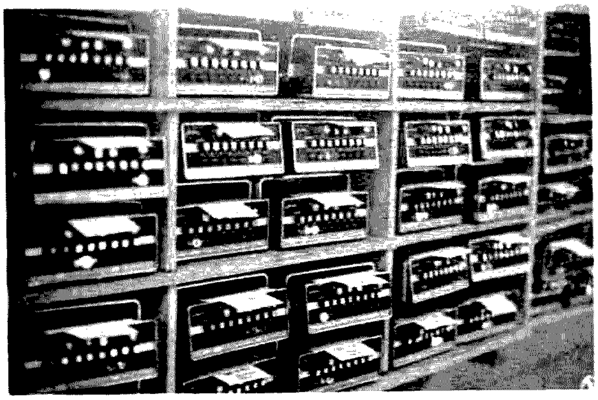
The ham end of their business is small compared to their scanner sales – but they have their production lines so well worked out that they can change from a ham rig to a scanner almost without a pause.

I took a few photographs to try and capture the idea of the pace at their plant.

There are hundreds of girls sitting in row after row of assembly lines. Their proficiency is such that a change from production of one unit to another takes only minutes.

At the end of one line I found stacks of completed boards, ready to be mounted in the cases. Regency makes their own cases – they make virtually everything involved in their units.

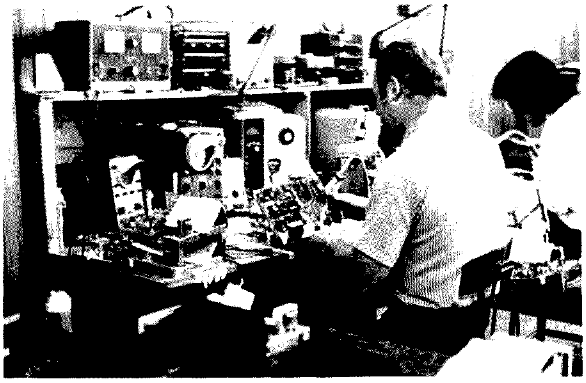
Here are some of the AR-2 meter power amplifiers which have just been completed and are headed for the final checkout before being packaged.



There are hundreds upon hundreds of scanners set up in racks where they are run for several hours to make sure they are in perfect shape.

This is one day's returns for factory repair. The repair department puts great emphasis on a fast turnaround – they want the unit checked out, fixed and on its way back to the customer in one day if at all possible.

On the left is Keith – and on the right is a small part of one day's production of scanners, transceivers and amplifiers. Impressive.



This is one of the test positions for servicing. One of the main problems with scanning receivers is the use of the wrong or bum crystals! At least that makes the sets easy to fix.

We were impressed by the HR2B – very much like the HR2A except a bit more power output – and twelve channels transmit and receive – a nice new front panel design – and a high-low power switch where battery current is a factor. In this day of rising prices it was surprising to find that all these improvements have been added with no change in price – still a fantastic $229.

The HR-220 is remarkably like the 146 MHz gear and should help us to get some activity on that band. We are already working on a project to convert this fine rig into a repeater. It is ideally designed for this with its separate transmitter and receiver boards – its narrow band i-f filter – and the ease of getting at the boards and components. With a COR and a little work it looks as if we will be able to have repeaters for 222 MHz for $239!

. . .W2NSD/1

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A VERSATILE CODE PRACTICE OSCILLATOR

The neophyte intending to become an amateur radio operator, and all amateur operators intending to achieve a higher class of license, have had or will have use for a code practice oscillator, Ham journals, publications and handbooks have published scores of code practice oscillator circuits over the years. Many of them present certain disadvantages in their use. The CPO described in this article overcomes these disadvantages.

This code practice oscillator is battery powered; therefore, one is not tied to the wall by a line cord. Its current drain is less than that of a flashlight. The CPO has provisions for up to four keys and four sets of headphones. It is best to learn code with headphones since they tend to exclude external noises which disrupt one's concentration. Also, code is usually heard with headphones at the receiver, so one does not have to learn to use headphones later. Because of the portability of the CPO and the use of headphones, one can even have code practice sessions in a public library. Try that with a speaker type CPO! Up to four people can use this CPO at the same time. Any two people can communicate with each other; all four can practice to themselves; or a net can be established in which net procedure can be learned and practiced, or any of the four can provide copy practice to the other three. Early experience copying different fists is obtained.

East set of headphones has its own volume control allowing each person to set his volume level to his own preference. The person keying the CPO hears his own sending, making it easy to detect and correct mistakes and to hear his own fist, which helps to prevent developing a swing in his sending. Several of these units can be cascaded by setting all the mode switches to 'net' and using a patch cord between units. Several minutes of code instruction can be given to a group in this manner, and then by pulling the patch cords, several minutes of practice within small groups is possible. Two different code speeds can be given at the same time to two different groups by means of proper setting of the mode switch and appropriate patching.

This CPO utilizes digital integrated circuits which allows the builder to gain experience with IC's, etched circuits, and miniaturization and yet does not require much time in construction. Two MRTL (Motorola Resistor Transistor Logic) integrated circuits are used. They are inexpensive and are available from the larger electronic mail order houses. The MC 824P is a quad 2-input NOR gate. Each NOR gate consists of two common emitter amplifiers sharing

the same collector load resistor. Output is from the paralleled collectors. The NOR gate draws collector current if either input is made positive with respect to the emitters. The MC 889 is a hex inverter. Each inverter is merely a transistor with a collector load resistor and a base resistor. Output is from the collector. When the base input is made positive relative to the emitter, the collector draws current. Therefore, when the input of the inverter or either input of the NOR gate goes high (positive), the output goes low (towards emitter potential). Conversely, when the input to either device goes low the output goes high.

The NOR gates and four of the inverters are connected in such a way that one form of AND gate is obtained. In an AND gate, the output goes high only when both inputs are high. AND gates are necessary in the CPO. The NOR gates could not be used by themselves, because one would hear the oscillator tone when the key was up, and silence when the key was down. The other two inverters are cross-coupled with two capacitors and the bases biased with two resistors to form an astable multi-vibrator. Its output is rich with odd order harmonics. This sort of tone is much easier to listen to over a period of time than is a pure sine wave.

The circuit diagram is shown in Fig. 1. In the switch position shown, A and D are paired as are B and D. In the third position, A and D are paired as are B and C. In the fourth position, all are interconnected, forming a net. In the fifth position, each person practices alone without interfering with the others.

A convenient layout for the circuit, on an etched circuit board, is shown in Fig. 2. With this layout, no jumpers are needed and a single foil board is used. The board may easily be prepared in either of two ways. The first method uses an unsensitized circuit board which is placed behind the drawing of the board layout. A sharp sewing needle is used to pierce the page and indent the foil to show pad locations and bends in the "wires." Any of several resists (paint, tapes, dry transfers, etc.) are applied to the board. The board is then etched, drilled, cutout and the resist removed.

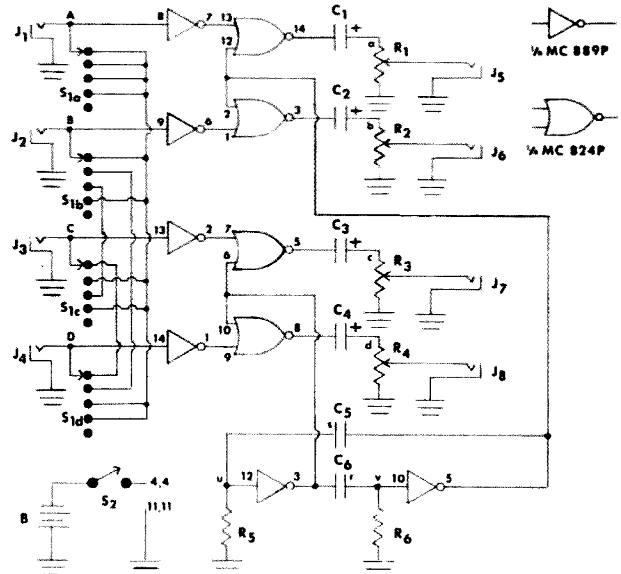

Fig. 1.

PARTS LIST

C1, C2, C3, C4 – 5 μF 6V dc electrolytic capacitor, Sprague TE1084
C5, C6 – 0.047 μF 200V dc capacitor, Sprague 192P 47392
R1, R2, R3, R4 – 500Ω potentiometer, Mallory U-2
R5, R6 – 22 KΩ ¼W 10% tolerance resistor
J1, J2, J3, J4 – Phone jack, Mallory LA-1
J5, J6, J7, J8
B – 2 flashlight cells (size D) in series in a Keystone No 176 cell holder
S1a, b, c, d – 4-pole 5-position nonOshorting rotary switch, Centralab PA-2011
S2 – SPST toggle switch, Arrow-Hart 20994LH
Miscellaneous – Motorola Integrated Circuit MC824P, Motorola Integrated Circuit MC889P, utility box 3 X 4 X 5 in., standard or semi-automatic keys, 2000Ω headphones

Another method of preparing the circuit board requires a sensitized circuit board. An actual size photolith negative is made of the drawing. Many professional photographers in the larger cities are able to do this. The negative is placed over the sensitized board and held flat against it with a piece of plate glass. The board is exposed to sunlight for three minutes and then "developed" in a bath of trichloroethylene. After it dries, it is etched in a stro solution of ferric chloride and water.

The integrated circuit pads are drilled with a #72 drill bit and the other pads with a #70 drill bit. The resist is then removed with steel wool and the board rinsed with water. The board pads must be tinned for effortless soldering. With your fingertip,

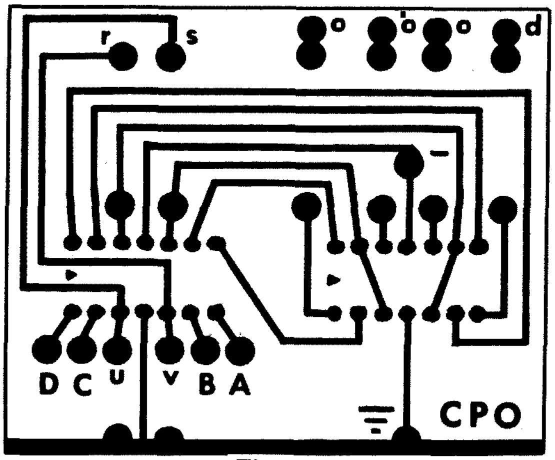

Fig. 2.

apply a thin film of soldering paste flux over all the pads. With a hot, low wattage soldering pencil having a tiny droplet of solder on the tip, QUICKLY tin all of the pads. Any lingering with a hot iron on the pads can loosen the foil from the board. Any pads that fill up can be redrilled. Resmear the board with a thin film of soldering flux and insert some of the components. These are installed opposite the foil side of the board. Put a tiny droplet of solder on the soldering pencil tip and apply this solder to the junction of the component lead and the board foil. One usually heats a joint with an iron and applies solder to the joint allowing it to flow, but in the case of circuit boards, the joint consists of tiny masses of metal which heat up instantly when the solder droplet is applied. When soldering IC's, and the use of a heatsink is impractical or impossible, get in with the solder and get out quick. Clip the component leads close to the board. Insert the remaining components and solder them. When you are finished, remove the flux with a cotton swab wetted with rubbing alcohol or trichloroethylene.

The resistors connect from pads u and v to the ground pads below them. The 0.047 μF capacitors are connected from pads a, b, c and d to their respective pads below them. The positive ends of the capacitors are connected to the pads a, b, c and d. The pad with the negative sign next to it is connected to the power switch and the pad with the ground symbol is grounded.

The integrated circuits are notched at one end. On the circuit board drawing, a small triangle denotes the end of the set of pads to which the notched end of the IC is to coincide. The MC 889P is mounted above pads A, B, v, u, C, and D. The MC 824P is mounted below the pads a, b, c, and d.

The board can be mounted to a utility box or chassis by drilling a hole or two in clear areas of the board and bolting it to the mounting surface through spacers in order to raise the board off the surface. Small wires are now connected between the board and the external components (jacks, pots, etc.). I built my unit in a 4 x 5 x 3 inch utility case without much crowding.

The construction of this CPO is an interesting project, in that not only will you develop your code proficiency; you will sample other techniques and skills you may not have tried before such as making etched circuit boards, rapid soldering, equipment layout and construction, and working with integrated circuits. It is not a unit that is built, used for a short time and discarded. It will be used again and again to keep your fist up, improve your code speed, and upgrade your license.

. . .Wilson

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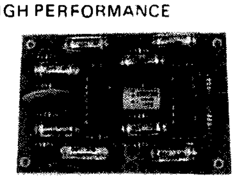

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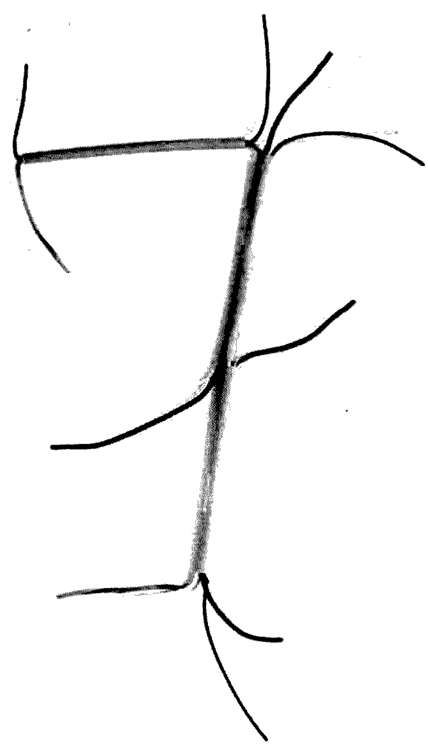
WIRING HARNESSES MADE EASY

Most of us at one time or another have admired a neat wiring job in a piece of home-built equipment. Usually it was good parts placement combined with a well laid out wiring harness that gave the pleasing effect. Many home constructors shy away from a harness because the effort to plan and manufacture a harness does not seem justified. I have developed a few techniques which make wiring harnesses a cinch. Although the ideas are probably not unique, they will probably be very helpful for the newcomer to the hobby.

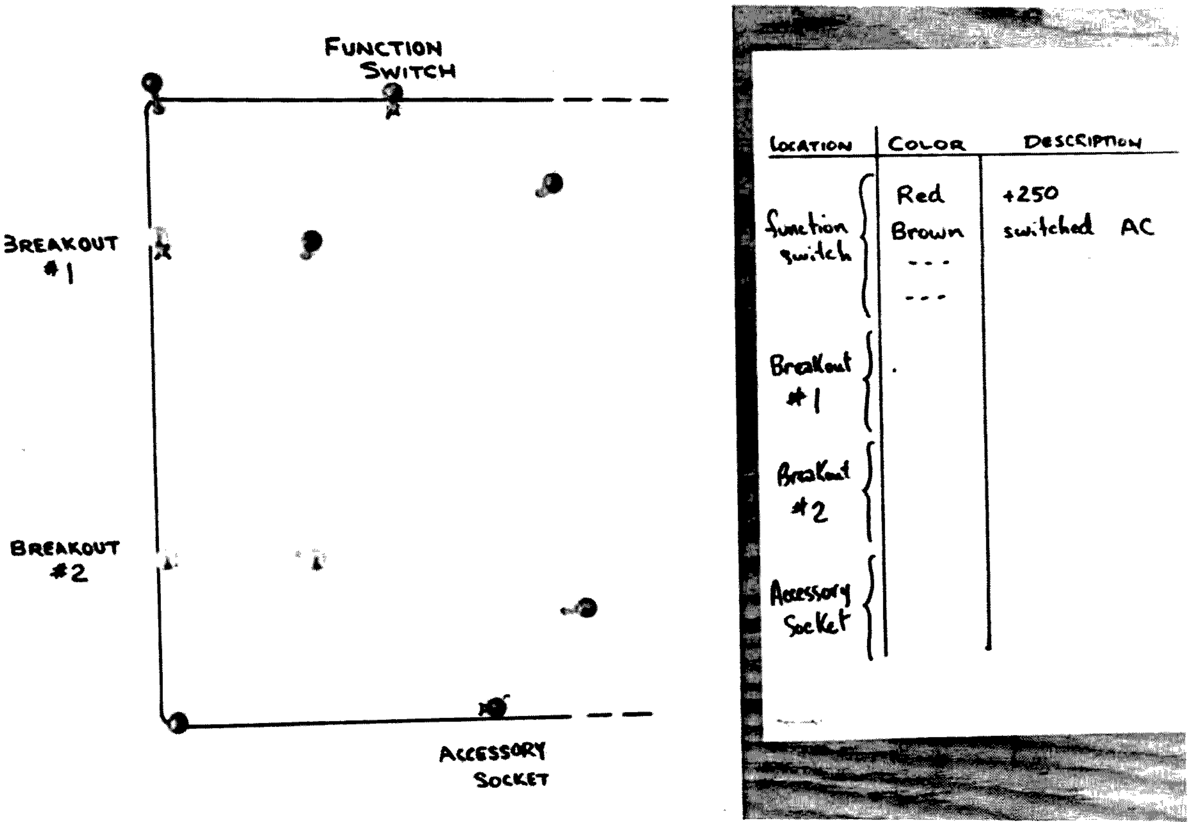
Generally the wiring harness is used for routing of filament, high voltage, bias, control and audio wiring from stage to stage under chassis. Often the harness is placed along the edge of the chassis, but on occasion may be placed in the center of the chassis. Placement parallel to the chassis edges is recommended for neatness. In order to keep the wires of the harness bound together neatly, general practice has been to lace the wires with wax-impregnated linen cord. It was mainly to circumvent this time-consuming chore that the following methods were developed.

The "Jig and Tape" Method

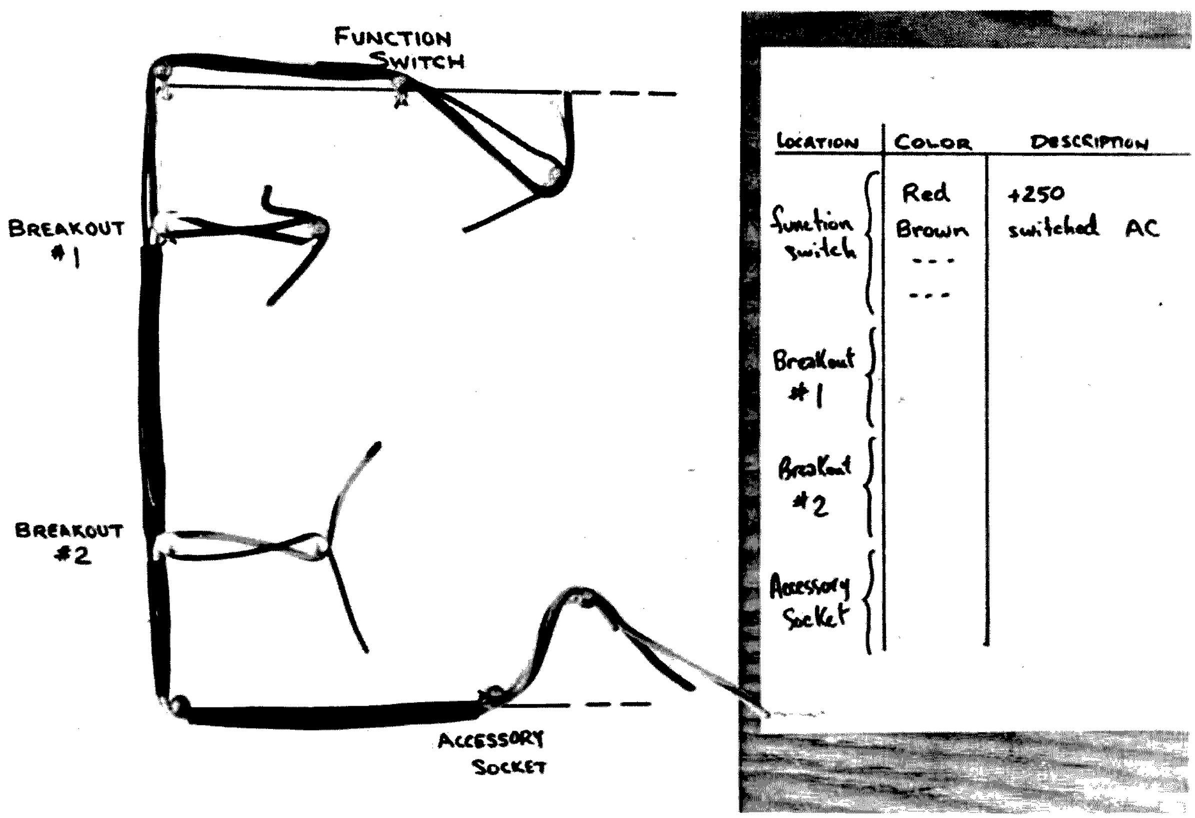
Needless to say, the constructor will have chosen a chassis and planned the part layout before proceeding to the wiring harness. After deciding on a route for the harness, it is traced on a sheet of paper stapled to a plywood base as shown. Nails are then driven into the plywood at each corner,



A wiring harness constructed by the sleeving method. Break the sleeving at corners and break-outs. If desired, stick the harness to the chassis with small dabs of epoxy cement.



The use of a jig for wiring harness assembly keeps the harness in shape and allows for easy taping. Nails are 7½ cm in length. As harness is assembled, wire coding is jotted down at right.



Assembled harness can be taped while still in place on the nails.

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breakout and end termination; other nails are driven in for anchoring the wire ends. After placing the wires, tape the harness with light plastic electrical tape. The obvious way is to wind the tape about the wires; however for light harnesses, place the tape lengthwise and wrap around the wires using one or more strips as desired. Wind extra tape around the harness at ends and breakouts to give added strength. Keep track of the color coding as you proceed.

The "Sleeve" Method

This method involves running the wires through lengths of sleeving which have been cut to fit between discontinuities in the harness. Sleeving size may vary along the harness to fit the size of the wire bundle. This method is very quick and normally a jig is not needed unless the harness is long or if the sleeving is too flexible. I like to use the stiff fabric type of sleeving rather than the plastic type. Plastic tubing in various sizes is available in 25 ft lengths from such suppliers as Allied Radio Corporation.

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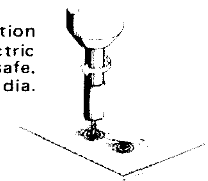

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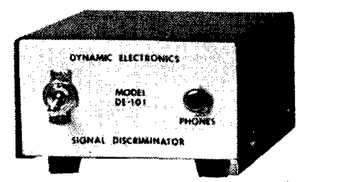

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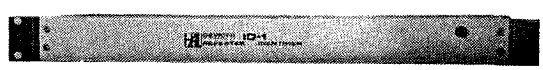

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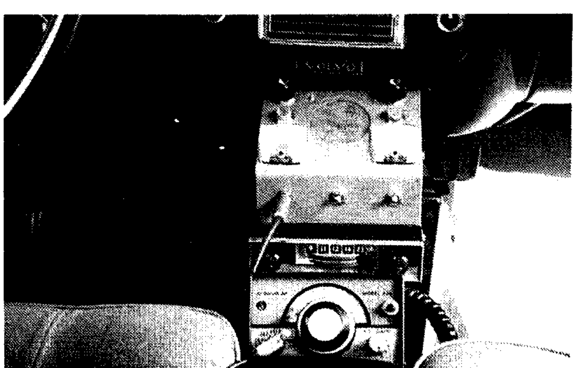
A big signal from a small car is not impossible

One of the first things the active mobiling ham does when he takes proud possession of a new car is to attempt to figure out how and where to mount the rig. Operating efficiency, mechanical and electrical factors are high on the list of considerations, second only to type-approval by the XYL. After enduring years of QRM from this source with previous mobile installations, using the customary under-dash location on the passenger side (with its attendant complaints of restricted legroom, bruised shins and torn nylons) use of this area was ruled out in my new car. This decision was supported by the fact that in this car, as in almost all new cars, the dash itself and the space beneath it has been sneakily phased out at the factory by inconsiderate designers, and has apparently gone the way of the buggy-whip socket and running boards.

The space in the center of the car over the driveshaft hump was too small for the conventional low-band transceiver. This left only the trunk area, and a method of trunk-mounting the rig and remote-controlling it was then worked out. Requirements from the driver's position included full frequency coverage over the entire phone subband of the operating frequency; on-off power switching; volume control; metering of plate current, modulation and rf output in transmit mode; metering of signal strength in receive mode; microphone input; speaker output; headphone output (more on this later); and as a final refinement, controlled illumination of the meters and VFO dial. No part of the equipment could extend into the passenger side of the car, serving the function of a noise-blanker (XYL type). On the rig itself, there were to be no major modifications or hole drilling.



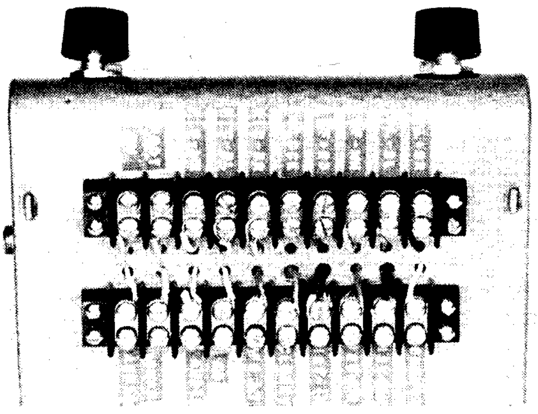
Backseat driver's view of the control unit, VFO and auxiliary rig.

Front Seat Mounting

I decided to use an external VFO, and to build a small control unit for the remaining functions. An armrest, fitting between the seats, with a shelf extending forward over the driveshaft tunnel, was obtained from the car dealer. Similar units, with or without shelves attached, are available inexpensively from many auto accessory stores, to fit either bucket or bench seats. The shelf can be shortened to clear four-on-the-floor, and usually will still accomodate the VFO and control unit in line. If space is extremely limited, the VFO and control unit can be stacked vertically. In my installation, with a steering-column-mounted gearshift, the VFO was bolted to the shelf, positioned with the tuning knob easily accessible when using the armrest. The control unit was also bolted to the shelf, forward of the VFO. The shelf is fastened with self-tapping sheet-metal screws to the driveshaft housing, for both rigidity and theft control. All wiring is run out of sight beneath the shelf and carpet, along the driveshaft housing, under the rear seat and into the trunk.

Frequency Control

The rig I use has an external VFO, with integral rf gain control, which connects to the transceiver by a short cable and octal plug. Most transceivers of recent vintage have provision for plugging in an external VFO. Those that do not can usually be adapted without too much difficulty to



Rear view of control unit.

accept an outboard unit, either factory made or homebrew, plugging into a rear-apron-mounted octal socket. Many excellent articles on construction of separate VFO's have appeared in recent ham publications.

An octal socket and plug, with shells for each, was obtained. After measuring the needed extension length from the existing VFO plug to the socket on the trunk-mounted transceiver, a 14' extension cable was made up. The circuit diagram of the VFO cable includes one 72Ω coaxial line for the frequency control lead. The velvet lined junk box contained only 52Ω RG-58 antenna line coax. I tried this and it worked perfectly. It has been said that lengthening the VFO lines would throw off the dial calibration, due to added capacity in the cable. Like the bumblebee, whose wings have been determined by engineers to be aerodynamically incapable of supporting him in flight, but who doesn't know this and flies anyway, the long cable was tried. No shift in dial calibration was noted. Such shift might occur in some types of VFO's – if so, it can probably be compensated for with the trimmer capacitors in the VFO circuitry. Four-conductor color-coded rotator cable was used for the remaining power leads in the extension cable. The lead supplying power to the VFO dial light was omitted.

Function Controls

The unit was built into a sloping-front meter case, Bud CMA-1930A, measuring 5 x 8 x 5". Two barrier-type terminal strips are rear-mounted on the case, and all interior wiring brought out to the strips. From the strips, all control lines to the trunk-mounted equipment are attached via spade-type terminals.

Audio

A three-inch-diameter speaker, with the cone protected by aluminum window-screen covered with grille cloth was mounted under the center opening in the meter case. In many cars, it is virtually impossible to reach the speaker wiring on the broadcast band receiver without major surgery. In other cars, with accessible speakers on the BC radios, the speaker in the control unit could be eliminated, and a DPDT switch used to feed the audio (after going through the volume control in the control unit) from either the ham rig or the BC receiver to the car speaker. In this installation, another type of rig with a very poor speaker is also used occasionally and a DPDT switch (shown at the center of the control unit) is used to switch the audio of either unit to the speaker. The speaker is wired through a closed-circuit phone jack to a volume control (20Ω potentiometer) in an L-pad configuration, and from there to the terminal strip. From the strip, a two-conductor shielded line goes to the trunk, terminating in a shielded plug connecting to the phone jack on the transceiver. Inserting the plug silences the internal speaker in the rig. The receiver volume control is left about three-quarters open, and the volume controlled by the pot in the control unit.

The headphone jack is used on extended trips with my wife. For some reason which I cannot understand, she fails to appreciate the beauty of the mellow tones contained in an SSB pileup on the lower end of twenty meters. By putting her behind the wheel, I am able to sit in the co-pilot's position, plugging in the phones which silence the speaker in the control unit. She thus drives in comparative peace and quiet, while I work the rig. If you employ this system, a word of caution – the use of only the right-side headphone is recommended. This permits you to monitor the driver's carefree comments such as, "Why are those two little red lights flashing on the instrument panel?"

Rf gain is controlled by the pot in the control head. In practice, this control is infrequently used in mobile operation. If

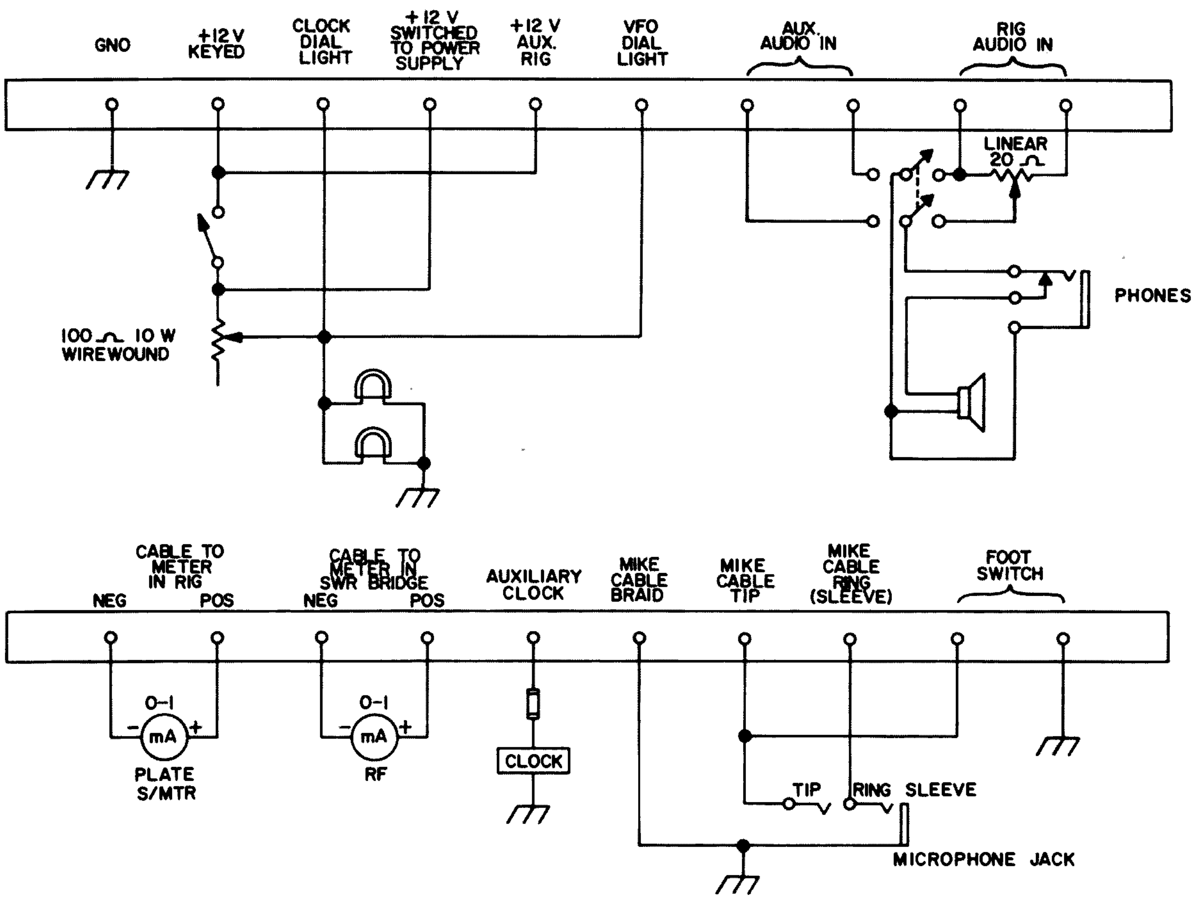


Fig. 1. Circuit diagram.

your remote VFO does not contain this control, leave the gain control on the rig wide open and forget it.

Power switching is controlled by the SPST switch on the right front side of the panel. Use of a colume-control-mounted switch, if available, would eliminate the need for a separate switch. The keyed hot line from the ignition switch feeds into the terminal strip, through the switch and back to the terminal strip to a line connecting to the fuse at the trunk-mounted power supply.

Instrument light control, very useful with night driving, is done through a wire-wound 100Ω 10W variable resistor, taking power from the output side of the power switch. The use of a wire-wound resistor is mandatory – carbon resistors arc and burn out. A line brought out from the instrument light socket to the terminal strip connects to the dial light in the VFO, permitting control of lamp brilliance on both meters and the VFO dial.

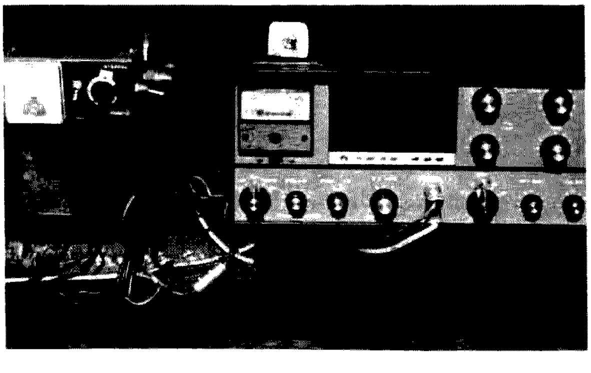
Meters are miniature 1 mA dc meters. Each meter connects directly to the terminal strip and from there by way of color-coded two-conductor cables, to the trunk compartment. At the transceiver, a DPDT switch is mounted on a small bracket, fastened with bolts and washers through one of the vent slots at the top of the transceiver. The switch is wired to permit the lines feeding the plate current meter in the rig to be switched either to the internal meter in the rig, or to the line connecting to the remote meter in the control unit. A small polarized in-line plug and jack is used, permitting easy disconnection if the transceiver is to be removed from the car for fixed-station use or servicing. With switch in the "internal" position, the meter in the rig is used for tuneup. The "remote" position permits monitoring plate current and modulation when transmitting and signal strength in receive mode. The remote meter scale was not recalibrated, and readings are inter-

polated from the degree of needle deflection. A miniature DPDT switch is similarly mounted in the SWR bridge, with a polarized in-line plug and jack connecting to the second meter in the control unit. The switch is similarly used in the "internal" position for tuneup and antenna adjustments, and in the "remote" position (with the bridge "fwd/rev" switch in the forward position) to permit monitoring of rf output from the driving position. Most SWR bridges use a 100 μA meter, and it is necessary to advance the sensitivity control on the bridge to obtain a readable deflection on the control-unit meter. As only a relative indication of rf being radiated is needed, calibration is unnecessary – the sensitivity control is set to give full-scale deflection of the control-unit meter when the rig is in the tune position.

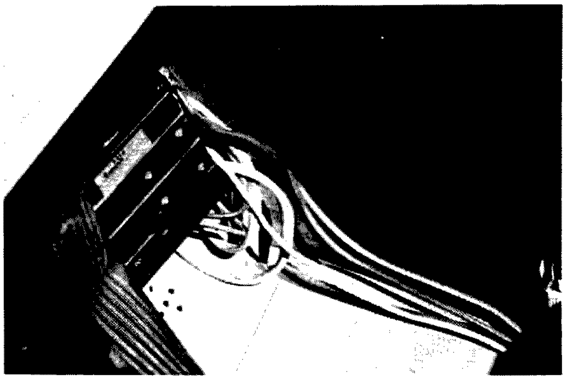
The microphone jack is connected by a three-wire shielded cable to the terminal strip, and then by similar cable to a three-conductor shielded plug which connects to the mike jack on the rig. A ceramic mike with PTT switch is normally used. The two control leads from the control unit mike jack also connect to two additional terminals on the terminal strip and then to a foot switch. When used with a miniature military-type microphone which clips to either eyeglass frames or a lightweight headband, the foot switch permits no-hands control of the transmit-receive function.

Transceiver Mounting

The U-bracket formerly used for underdash mounting of the transceiver was mounted inside the trunk, on the underside of the rear deck, just forward of the hinged trunk lid. Large self-tapping sheet metal screws hold the bracket in place. To the left of the rig, a small homebrew bracket was similarly mounted to support the SWR bridge.



Trunk mounting. Transceiver meter switch on bracket over meter, SWR bridge meter switch on the right side.



Power supply mounted in wheel well. Note ventilation holes.

The power supply is also trunkmounted. It is desirable to get the supply away from the engine compartment, which gets up to well over 400°F on a hot day. My present car has a well on the left side for a second spare tire, and this space was used for the power supply. The picture shows extra holes drilled in the well for ventilation, both in front and behind the supply. Use heavy gage 4 or 6 stranded color-coded wire, available from electrical supply houses, for direct connection to both positive and negative battery terminals rather than using the car frame for the negative lead. This supplies full voltage to the power supply. If trunk mounting in your car is impractical, conventional engine-compartment mounting may be used and an extension cord with proper mating plug and socket may be used to reach the transceiver in the trunk.

That's about it. This rig has now travelled well over a quarter of a million miles, during which time I have had lots of fun, many fine QSO's, made a few emergency contacts, qualified for WAS, WAC, and made at last count contacts with 157 foreign countries. Since making up the control unit, I have enjoyed more efficient and convenient use of my transceiver. A similar unit, modified to fit your own car and rig, will give you many miles of carefree hamming. See you on the road!

. . .WA1GNX

Frank J. Derfler Jr. K9KIC
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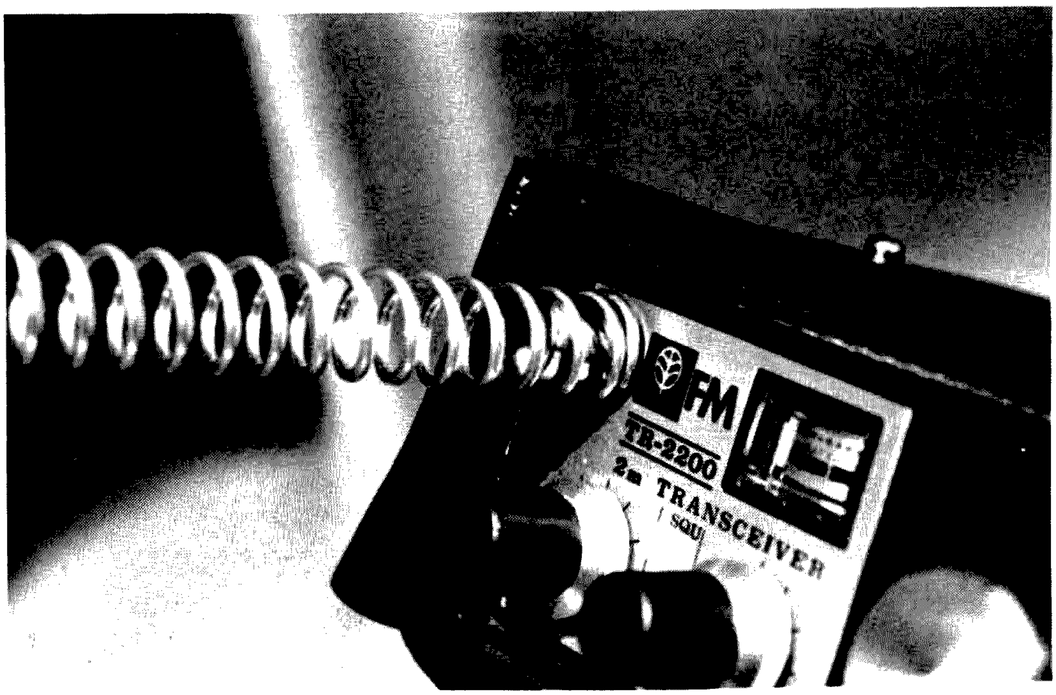

The spring fits snugly over the end of the standard TR-22 antenna. It can be removed in a second for use of the regular antenna.

The antenna on the Drake TR-22 seems to be breakage prone if subject to hard use. This is because it is a nice telescoping type which hides out of the way when not in use. It doesn't flex a bit, and any sharp blow in the extended position means trouble. A stubby antenna would be just the thing to help the situation, but the commercial stubbies must be modified to fit. Here are two antenna ideas that provide quick change capability with the normal TR-22 antenna, no modifications, easy storage, and very low cost.

A single thin black wire strung up the shoulder strap makes a dandy unbreakable invisible antenna. The wire can be woven in and out of the various buckles and rings of the strap and taped where needed. A large jaw alligator clip at the bottom attaches to the top of the regular collapsed antenna. The length of wire plus clip should equal the length of the regular antenna when extended. This antenna should only used in the over-the-shoulder position for maximum signal radiation. When not in use it should not be clipped to the case as it will tend to detune the normal antenna. Experiments with different lengths of wire in an attempt to compensate for the antenna being so close to the body had no consistent results.

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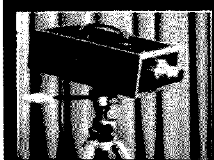

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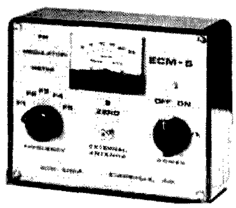

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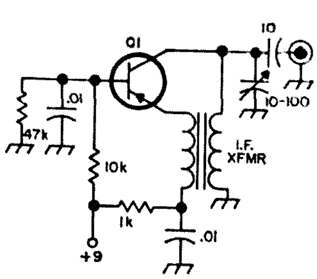
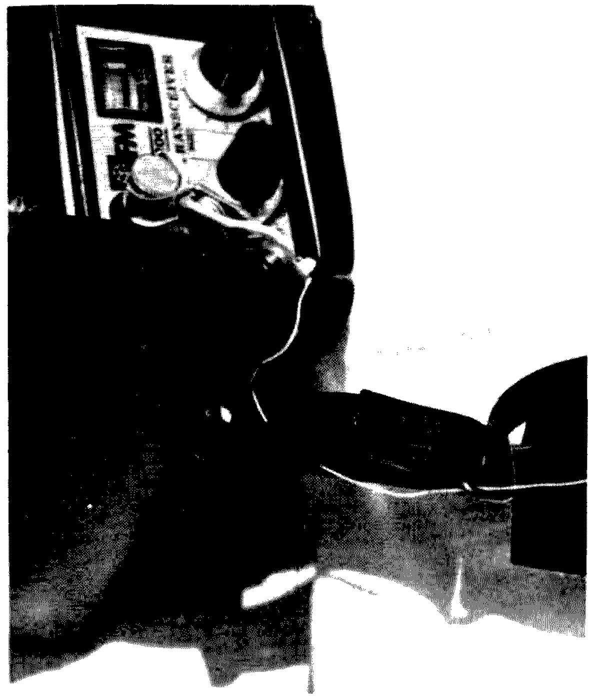


This beat frequency oscillator may be added to existing receivers with a minimum of difficulty The BFO frequency is determined by the i-f transformer which provides feedback from collector to emitter. Transistor Q1 should be a SK3008, GE-9 or HEP-2.



A large clip fits over the end of the TR-22 antenna and a thin wire is woven and taped up the strap.

A non-breakable stubby antenna was made from a hardware store spring. A common display in hardware stores is "Select a Spring" from the company of the same name in Jersey City, New Jersey. Their number 60 spring looks like #16 wire and the turns are spaced 2 turns to the cm. It fits snugly over the top of the TR-22 antenna. Best of all, it sells for around thirty cents. The one small drawback is that it resonates at 220 MHz, but a 15.5 cm piece of wire on top of the spring got it to resonate on two meters. For some unknown reason, Murphy didn't strike, and this bright plated spring took solder easily. If you find a different length spring you can easily use a grid dip meter and a field strength meter to get it on frequency. This antenna can be readily carried in the microphone pouch when the regular antenna is in use.

While both of these antennas are compromises and are not quite as efficient as the built in unit, they will withstand rough use much better. The strap antenna does the best job, but the reception difference with either antenna is noticeable only on the marginal signals. The TR-22 is a beautiful and versatile rig. Now you have made it more so.

. . .K9KIC

LEADING ZERO SUPPRESSION FOR DIGITAL DISPLAYS

T. R. Jackson W1DMU
P.O. Box #1
Corinth VT 05039

A simple circuit is described which suppresses leading zeros in displays using cold cathode decimal indicators.

Leading zeros in a Nixie type display serve no useful purpose, unless it is considered useful to proclaim the instrument owner's multi-digit affluence. Indeed, a display such as 00539 is harder to read than just 539. Since it is a simple matter to expunge the superfluous zeros it seems a pity that it is not done more frequently in amateur-built equipment.

A circuit which will suppress leading zeros at well under $1 per digit so equipped is shown in Fig. 1. There are no cumulative problems in cascading these suppressors, so the circuit can be applied to as many or as few digits as the builder desires. With the addition of the SPST switch and resistor shown, the choice of displaying or blanking the leading zeros can be made from the front panel; the single switch will control the blanking on all decades.

The circuit will be described in some detail, to assist the potential user in adapting it to his own special requirements. The values of voltage and current given are rough approximations only; a more careful consideration of values and tolerances will be deferred to the section on "Circuit Details." Referring to Fig. 1, when the display driver has decoded a zero, "KO" (cathode #0) will be grounded, for this is what it takes to select a numeral in the display tube. All current through R1 is shunted to ground, and cannot turn Q1 on. For this description, an "on" transistor is one which has base current flowing so that it can conduct easily from collector to emitter, while the collector of an "off" transistor looks like an open circuit. When Q1 is off, the 500 μA supplied by R3 has no place to go other than the base of Q2, so Q2 turns on. When Q2 is on, the Nixie tube anode cannot be at more than 100V above ground because the 100V zener diode Z1 is then effectively connected from anode to ground; by the laws of Zenerism enough current will be drawn by Z1 through R_A to clamp the tube anode at 100V. 100V is not enough to maintain the glow discharge in the tube which promptly does just what we want: it goes off.

If any number other than zero is decoded, KO will be at approximately 50V because of R1-R2 which acts as a voltage divider for the 145V at the tube anode, and 50 μA will pass through R2 turning Q1 on. Q1 then shorts Q2's base drive to ground, turning Q2 off. With Z1 thus disconnected from ground, the anode voltage is free to rise and the tube resumes normal operation. After the tube is lit, the steady voltage on Q2's collector will be the tube anode voltage (145V) minus the zener voltage (100V), or about 45V, but it may have to rise to some 70V peak at first to ignite the tube.

Whenever any tube is lit, the Q2 of that stage is off; about 50 μA is then supplied via R4 to the base of Q1 *in the next stage.* Since base current to Q1, from whatever source, ensures that the associated tube will be lit, the blanking is thus disabled after the first non-zero stage. This effect ripples all the way down the chain of digits, so that all tubes after the first lit one are always lit

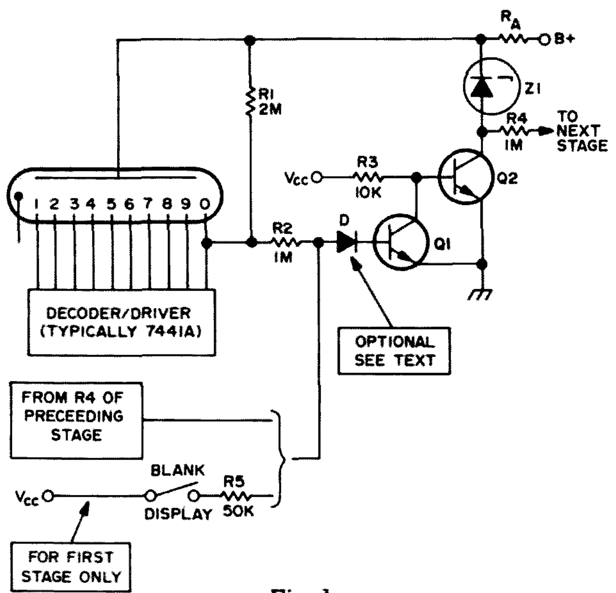


Fig. 1.

irrespective of zeros. In the special case of the first stage there is of course no preceding stage; if desired the switch and resistor shown can be used to provide the option of disabling the blanking.

When decimal points are provided an option can be included to automatically disable the zero blanking on digits after the active point. There are many variations of decimal point circuitry possible, and it is necessary to know just how the points are controlled before disablement circuitry can be designed. For the case where the points are selected by a simple grounding switch (or NPN transistor), Figs. 2 and 3 show typical arrangements. As Figs. 2 and 3 merely show modifications to the circuit of Fig. 1, unlabeled or missing parts and values are the same as in the basic circuit.

Figure 3 also shows one method of blanking the *entire* display, without regard to zeros, points, etc. This facility is particularly useful in counters which do not have storage latches, and in which it is desired to blank the whole display while counting. If the zener diode and high voltage transistor are to be included for zero blanking anyway, using them for total blanking also may prove less expensive than the usual method of turning off the B+ supply. +5V on the blanking bus will turn off the whole display.

Circuit Details

Whether or not the diode (D_{opt}) shown will be required depends on the type and quality of switches in the indicator driver. If the voltage at K0 is greater than about 0.6V when the zero is selected, then in the absence of D_{opt} some base current will go to Q1. If *enough* base current flows, the tube will not blank; how much is "enough" depends on the gain of Q1 and Q2. With a mechanical switch or saturated transistor there is no need to consider the use of any diodes at D_{opt}.

If the standard TTL Nixie decoder-driver is used, the 7441A, the formal specification gives the "on" voltage as 2.5V maximum, at (the abnormally high current of) 7 mA, and this would demand 3 or even 4 silicon diodes in series for D_{opt}. A look at the standard Texas Instruments schematic for the prototype 7441A shows 2 collector-emitter paths and a diode all in series between the selected cathode and ground. From this one would expect at least 0.8V even at low currents. However, it seems that not all manufacturers use the same internal circuitry for their 7441A's. The version made by National

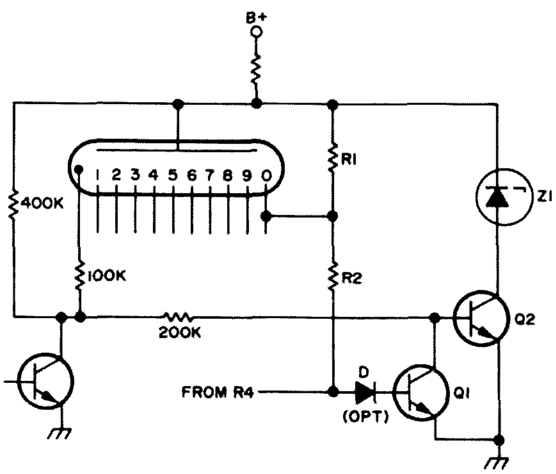


Fig. 2.

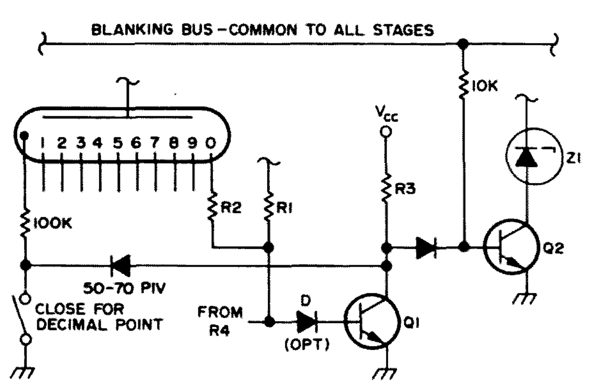


Fig. 3.

Semiconductor, for example, has just 3 saturated transistors in series between the selected cathode tube and ground (as an irrelevant aside, this particular version also decodes inputs greater than decimal "9" in an unusual manner that should be helpful to digital clock builders). I have recently tested a large batch of National 7441A's and found that most had an "on" voltage of 0.4V at 2.5 mA; only one was as high as 0.5V. With these particular IC's no diodes are required at D_{opt} for 2.5 mA service and this fact has been confirmed by practical use tests.[1]

The sum of the zener voltage (at about 50 μA) of Z1, plus V_{CES} of Q2 must be greater than the ignition voltage (usually 160V) of the tube. On the other hand, the zener voltage by itself (at whatever current R_A supplies) must not be greater than the tube's extinction voltage (usually 115V). If closely graded zeners are available it may be possible to use a Q2 with a relatively low V_{CES}, say 50V. However, with 10% tolerance types, a nominal 100V zener is ordinarily best.[2] With such a diode, the zener voltage would be between 90 and 110V, and a V_{CES} of 70V minimum is required for Q2. The Motorola MPS-HO5 at 36¢ will do, as will most of the 2N3858A's (at 30¢) that I have tested.

Q2 is either cutoff or saturated, and so dissipates only a few mW. When the stage is blanked, however, the zener dissipation is quite high. It is desirable to make the B+ as high as conveniently possible, as this calls for a large R_A which in turn reduces the power loading on the zener. As typical examples, both calculated for the worst-case when the zener voltage is 110V, if the B+ is 270V, and R_A is 50K, the zener dissipation will be 353 mW but if the B+ is only 180V, and R_A is appropriately reduced to 14K, the zener load will increase to 550 mW. Of course, as the power loading on the zener is decreased by increasing the B+, the dissipation in R_A increases, so there are *some* limits!

The rest of the components are non-critical. For example, R1 can be almost anything from 250K to 5 MΩ as long as R2 (more or less) equals ½R1. The limiting lower values for these resistors are set by the consideration that current shunted to ground through R1 is stolen from the numeral zero; the upper limits are set by the requirement that enough base current must flow to saturate Q1. With R2 at 2 MΩ only 75 μA is stolen from the zero, and Q1 needs a saturated β, or H_{FE}, of only 10 (at 500 μA collector current). Any one of thousands of different NPN transistors will do for Q1, as it has to stand off only V_{CC} (usually 5V); it is a rare transistor that will fail to meet the specification that collector-emitter saturation voltage should be less than ½V when driven with 50μA of base current.

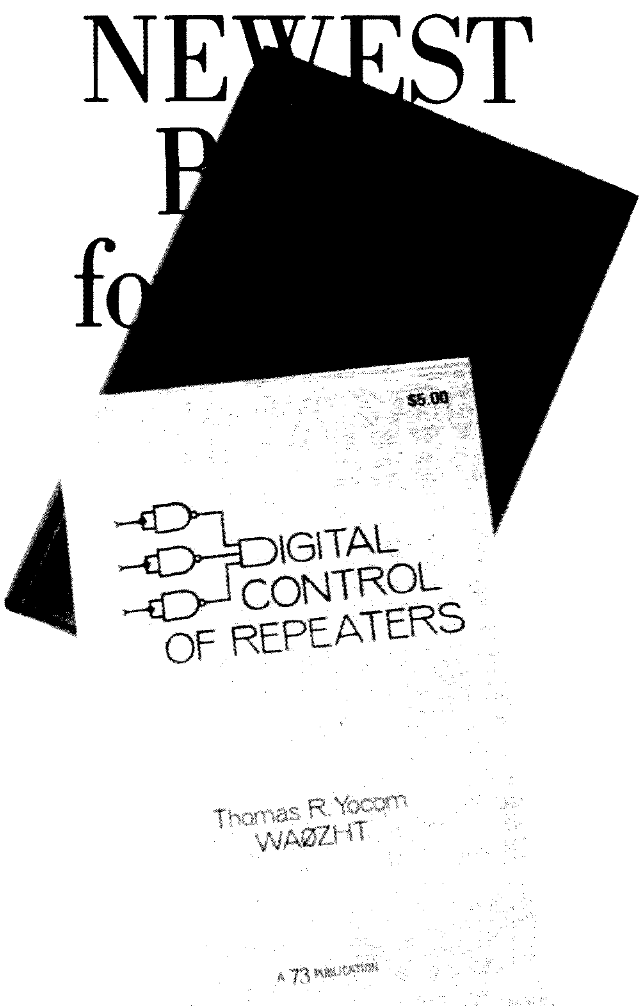
It could be argued that the Q2 collectors should be protected with a zener to ground, and this would no doubt be admirable if such diodes were free. In my limited experience, however, the transistors used have proved able to operate with the limited reverse breakdown required, without damage to themselves. In the case of the last stage, it would be prudent to include R4 and attach its free end to ground; this should draw enough current through Z1 to force it into its zener region where it can protect Q2.

In conclusion, I should point out that the same circuit will work just as well "backwards," by connecting each R4 to the preceding stage, rather than the following one; in this configuration it would suppress *trailing* zeros. With further modification it could suppress *both* leading *and* trailing zeros, but I have not thought this worthwhile, especially as the trailing zeros do have some significance. I would also say that I feel quite well rewarded for the minor effort that was needed to add these circuits to several of my instruments. A display definitely appears friendlier and more intelligent when it no longer apes the mindless, and all too common, computer printout format of "XXXXXA11-Spaces-Must-Be-Filled-Regardless000000000."

...W1DMU

[1] Selected 7441A's, tested for "on" voltage less than 0.5V at 2.5 mA were available from the author at $2.00 each in ceramic DIP at the time of writing, and they may still be. When enquiring, please enclose an SASE. One "D_{opt}" may suffice for the more modern 74141, as of a batch recently tested, only one measured > 1.25V @ 2.5 mA.

[2] 100V 10%, 1W zener diodes suitable for this use may be had at 4 per $1 ppd., from M. Weinschenker, Box 353, Irwin PA 15642.



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THE MEASURE OF A CAPACITOR

Did you ever come across a capacitor whose value you didn't know? Did you ever want to know the range of that variable capacitor, but you don't have a grid dip meter? Here is a way to calculate the capacitance of any capacitor that is not in a circuit, using nothing more complicated than a stepdown transformer, a voltmeter (VTVM or other high impedance type), one or two resistors, a little Ohm's Law, and a knowledge of the reactance formulas.

The system is this: using a filament transformer, you connect the capacitor and a resistor of about 1 MΩ in the circuit, as shown below. Set the voltmeter to its ac range and measure the voltage across the resistor. Compute the current, using I=E/R. Now measure the voltage across the capacitor. Compute the reactance, using the formula $X_C=E/I$. The I is the same one that you measured before. Don't worry if the sum of the voltages across the two components is not equal to the applied voltage. However, if you add the voltages vectorily (take the square root of the sum of the squares), you will find that you have the applied voltage.

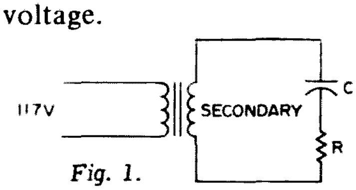

Fig. 1.

Now that you have the X_C, you can easily compute the capacitance. Remember that the formula is $X_C=\frac{1}{2\pi fC}$. The 2π is equal to 6.2832, the f is 60, and the X_C has been computed. Transposing the formula, we have $C=\frac{1}{2\pi f X_C}$. Remember that C is in Farads, so it will be very small.

You may find that the voltage drop across the capacitor is either too large or too small, If this is the problem, use either a larger or smaller resistor instead of the 1 MΩ.

...WB2VDX■

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Eastwood Village #50 No.
Birmingham AL 35210

AUTOMATIC TOUCHTONE DIALER

Have you ever noticed those "funky" little telephones you put a pre-punched card in, hit a button and smiff, crunch, kapoof, it dials a number and spits the card back at you?

Like to have one in the car for use on the local repeater? It's easy enough if you have a loose cassette recorder or car tape player. Make up a patch cord with the proper plugs so you can feed the touchtone's output to the tape recorder's input. Now, find some old cassettes and rewind them to the beginning and, after setting the input level properly, "record dial" a number on the cassette so when rewound to the beginning and played back, the result is the tones opening the autopatch, dialing the desired number and after a few seconds (so you can stop the tape) the tones to clear the patch. Now parallel the cassette recorder's output with your mike and mark the unit's output pot for the audio level to match your voice, and all you need do is slap in the cassette and hit the button – the tape will do the rest. The circuit of Fig. 1 can be used to match the tape recorder output (Low Z) to the mike input (High Z).

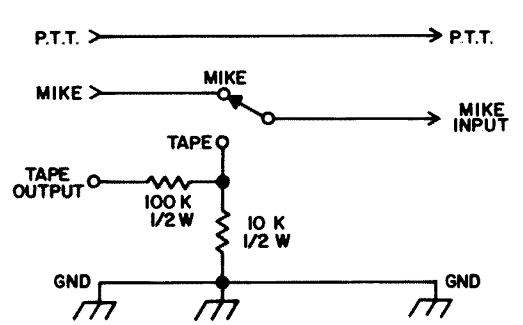

Fig. 1. Circuit for matching tape recorder output to mike input.

A small group of these cassettes (shortest length possible) with a couple of numbers on each and soon you've got all your numbers ready on automation.

If you have a tape deck in the car you're really set. Just install a jack so the mike plugs into and normals through the tape deck (Fig. 1). Now all that's necessary is to record the "phone numbers" on the auto tapes. Some auto-stereo enthusiasts have these recorders and will be glad to record the tones for you. Also, try 8 track tape dealers – often they will let you use their recorders for a nominal sum – tape duplicating companies will also record the tones for a small sum. The length of 8 track tapes is often long – 15 to 30 minutes. However, most cartridges can be opened by removing the screw in the middle, under the label; then carefully pull off a pile of this tape, leaving very little on the hub. Splice back together and route as usual, around the guides, etc. and close the cartridge back. Now record your "phone number" on the home brew short reel.

Although quite a novelty, I'm sure you'll find the auto-dialer very handy and it also relieves the necessity of carrying a pad.

The circuit of Fig. 1, which matches an 8Ω output to 50K (approximately) mike input is designed for use with a tape recorder at moderately low volume for average mike level, so very little fluctuation of values are needed.

. . .K4TWJ

NEWCOMER AND YOUTH TRAINING IN THE DARC

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Translated by HB9AJU

It is only in the eighth place in the rules constituting the DARC that we find "Preparation of interested persons for the radio amateur's examination." Nevertheless it is this training of the non-licensed members of the DARC which is the most obvious contribution of the club after the DL-QTC magazine and the QSL bureau. It is also a task which is carried out on an honorary basis. The fact that it is honorary is also instrumental in impressing on newcomers the image of brotherhood amongst radio amateurs.

As there are very few amateurs capable of complete self-preparation for the radio amateur's examination, it can be assumed that a large percentage of the approximately 1,200 new radio amateurs per year – a figure which represnts an annual increase of some 8% – have received their Morse, technical and operational training through the DARC.

The various German governments between the two world wars were not exactly well-disposed towards the idea of amateur radio. The reasons for this are to be found on the one hand in the principle of communications monopoly (which survived the old imperial telegraph laws) and, on the other hand, in the fear of revolutionary conspiracies.

From 1924 onwards every person in the Germany of that time who wished to listen to a tube receiver required an "audion experimental license." This license was only issued to members of recognized radio clubs. The result of this was that in 1925, when this absurd experimental license was finally abolished, such radio clubs counted some 50,000 members. Only these clubs were then granted club licenses for experimental transmissions. Later, re-issue of licenses was almost completely abolished. As a step toward interesting more enthusiasts in short -wave, Rolf Formis of the Oberdeutscher Funkverband in Stuttgart on his own initiative started issuing so-called DE numbers to SWLs in 1925. He also provided preprinted DE-QSL cards in order to secure reception reports from the whole of Europe for the Stuttgart amateur radio transmitter KY-4.

When, shortly afterwards, a new national amateur radio organization was founded – the DASD (Deutscher Sende- und Empfangsdienst) – these DE numbers were accepted more or less as the prerequisite for the subsequently introduced private transmitting license. Shortly after 1933, when the Nazi regime issued official private transmitting licenses to DASD pirates "of good conduct"

of frequency measuring equipment based on tube oscillators, as enterprising individuals might have had the idea of coupling it to a long antenna and using it for downtown CW operation! Even today when anyone even if he is not a member of the DARC – can take the radio amateur's examination, the German Bundespost prefers applicants previously to have passed a radio club examination and be in possession of a DE number, as this gives the postal authorities a good (because the regime could find no other suitably qualified persons, hi!) DE numbers were issued only after passing a prescribed examination. The licensing authority of the time, the Deutsche Reichspost, limited the number of transmitting licenses to 500 (later increased to some 850) because it considered this number to be the maximum which they could monitor. Membership of the DASD was anyway an absolute prerequisite if a "radio friend" (to quote the delightful term used) wished to obtain a license. As a sort of pre-selection for the radio amateur's examination, would-be candidates had to pass a DE test which comprised approximately two-thirds of the knowledge required for the full transmitting license. They were then required to send in SWL log sheets almost weekly. To give you an example of what this meant, I myself was finally admitted to the radio amateur's examination in 1935 only after two years of intensive SWL activity. Use was made of the logs to evaluate propagation conditions, and I believe that the collation of their contents resulted in some extremely interesting information and very useful propagation predictions. At that time there were, of course, no ionospheric sounding stations.

For the pre-war DE examintion – as for its present day successor – the Morse test was set at 40 letters per minute (eight words per minute), to this should be added an examination of the applicant's technical knowledge and operating ability. He also had to be in possession of an operational shortwave receiver for at least two amateur bands as well as frequency measuring equipment. For this latter requirement an absorption wave meter was considered adequate. It was considered too dangerous to give blanket approval to all DASD members for the use impression of the applicant's capabilities before he takes the official examination (which, incidentally, he can attempt a maximum of three times only). Another point is that the DARC's QSL bureau will only forward DE cards (which must contain three separate reports), but not SWL cards, from non-DE listeners. However, a certain amount of unrest had arisen recently because the Bundespost examination for the VHF transmitting license does not require knowledge of the Morse code, although this is a requirement for the DE exam.

From an initial number of some 160 in 1925, DE stations had reached almost 2,000 in 1933, 6,000 in 1945 and are now around 17,500. The DARC's Youth Committee finds it regrettable that the number of *active* DEs is less than 10% of all DARC members, but this is due to the fact that DEs usually qualify for their transmitting license after a relatively short time and then have other interests than a purely listening activity.

Training up to the transmitting examination level in the local DARC clubs (the so-called Ortsverband) requires approximately 160 to 200 hours plus additional homework. Depending on whether one manages one or two evenings of instruction a week, total training time can be between three quarters of a year to a year and a half. Four hours learning in a week permits the trainee to remember more than four hours spread over a fortnight. However, more than four hours a week does not, in our experience, bring any improvement. An exception is that it is beneficial to spend a quarter of an hour a day on CW. The DE examination can usually be taken with success after about two-thirds of the total training time.

Radio amateur instructors are often disappointed by the fact that seldom more than half and often only a third of those pupils who start a course finish it. One of the greatest difficulties, especially for older aspirants, is that of mastering the Morse code.

Our knowledge of the physiological process of learning has advanced to a stage today at which we know that the speed and ease with which a piece of information stored in the brain can be retrieved depends

on the frequency with which use is made of this information. Applied to CW, this means that constant repitition is the *only* means of increasing CW speed.

Careful psychological preparation is also of greatest importance in mastering the Morse code. The instructor who paints a picture of CW as being a necessary evil which has to be learned to pass the examination can do irreparable damage by infusing into his pupils a subconscious rebellion against it. If, on the other hand, the instructor knows how to inspire his pupils with the possibilities CW offers as an internationally understood radio language, then he will have done much to smooth the path of learning.

Some years ago the DARC brought out a Morse code on discs by DL1FL for the purpose of self-instruction. This course starts completely from scratch and gives aspirants the possibility of acquiring examinational-level CW even if they are unable to attend their local club.

The DARC has also taken a step in a somewhat different direction to assist isolated would-be amateurs. Since 1964 vacation courses in all aspects of amateur radio have been held regularly. The very first of these was held in Benediktbeuren, a name which will doubtless be remembered for a long time. The participants in these courses pay only for board and lodging, usually at the maximum youth hostel rate of around DM 6.50 ($1.75) a day.

The courses held in 1964 and 1965 were directed exclusively at bringing pupils up to the DE level. The experience gained with them quickly led to an extension of these 2–3 week courses to radio amateur examination level. Up to the time of writing some thousand aspirants have benefited from these courses, which now are organized annually by five of the DARC's geographical districts. Of this 1000, approximately 600 have passed the DE examination. A further 225 have qualified on the spot for the transmitting license and around 175 for the VHF transmitting license (56% full licenses and 44% VHF licenses). Among the 600 DEs were a large number who, through their own efforts, were able to take the license examination soon after their return home.

It should be added here that the total of 160 consecutive hours cannot be considered sufficient to give a person all the knowledge required to pass the transmitting license examination. It does not include the repetition and training required in the form of homework, neither does it allow for time for reflection, a process which is indispensable if the newly acquired knowledge is to be thoroughly absorbed.

Nevertheless, these "Jugendlehrgänge," or "youth courses" as they have become known, make it possible to halve the overall time required to pass the amateur's examination. As a rule-of-thumb it can be said that it brings this time down to about five months. The term "newcomer course" would perhaps be better than "youth course" as the ages of the participants can lie anywhere between 15 and 66 years! Considerable problems are caused for the instructors – most of whom are not teachers in the true professional sense – by the wide variations in learning capability as well as the variations in the previous education of the participants. Especially for CW, smaller groups are rapidly formed comprising pupils of approximately the same level, in order to speed up the process of learning. Discs, tapes and Creed Morse senders are employed to adapt the pupils to actual examination conditions. Generally speaking, the best learning aid is the enthusiasm of the participants themselves and their determination to acquire the necessary knowledge as rapidly as possible. During the evenings one or two additional films are usually shown, often loaned by the industry or the Bundespost. Intermediate examinations provide the opportunity for everyone to test his knowledge. At the same time, the closely-knit community which springs up is of great help in bringing to the participants the true meaning of the great radio amateur brotherhood. This often goes so far that participants maintain contact with each other years afterwards and sometimes even visit the next year's course to operate the club station which is always a feature.

As it cannot be expected of qualified instructors that they spend three weeks vacation away from their families and, in

addition, have to pay for their own board and lodging, the DARC has undertaken to pay their expenses, including lodging, up to a figure of DM 30 ($9) a day. The number of instructors is limited to four per course, with a maximum of ten pupils per instructor. In the seven years that this program has been underway the DARC has spent some DM 50,000 ($15,000) for this purpose. Alone in this year the figure is almost DM 15,000 ($4,500) for this purpose. All other expenses have to be met by either the DARC district or the participants themselves. One reason for this can be found in the fact that the DARC, of its own wish, is completely separate from the state and official organizations, and receives no subsidies whatsoever from the Government.

In addition to all the above the DARC Youth Committee has organized three week-end seminars at the Hoher Dörnberg in Hessen for the benefit of the district youth committee members and to enable instructors to share their experiences.

There is today a noticeable trend in German schools towards courses which not only acquaint pupils with the increasingly technical life around them but also encourage them to make optimum use of their spare time. In keeping with this trend, many schools have formed groups of pupils interested in amateur radio. Several of the Länder (the administrative regions in the Federal Republic of Germany who, among other things, exercise complete authority in all matters of education) are now actively encouraging amateur radio in schools in an effort to interest pupils as young as 12–14 years in all technical matters. For example, in the Schleswig-Holstein Land a group of licensed teachers has been formed withthe aim of passing on their experience to other teaching staff under the motto "Amateur Radio in the School." A book with the same title has been written by DLINP as a further teaching aid, and in September of this year a fulltime amateur radio instruction course lasting one week was held in Heide, which eight teachers attended.

One difficulty, of course, is the relatively short life of these pupil's interest groups, in which knowledge of the subject at hand at the beginning is literally zero. For this reason, the greatest chances of success in interesting pupils in amateur radio are assured at grammar or high schools or in vocational institutes, in which however the pupils unfortunately often have other interests of a non-radio nature.

In schools, amateur radio activities are normally limited to those of the short wave listener. It is interesting to note in this respect that the Federal German postal regulations do not specifically permit reception of amateur transmissions within the terms of reference of the normal entertainment radio license; this situation sometimes leads to a certain confusion. As is the case in practically all western countries, the Federal German amateur transmitting license restricts operation of a transmitter to those persons possessing an amateur license. This is sometimes considered a hurdle in school radio clubs, where it is often considered desirable to allow pupils to obtain practical transmitting experience in the same way as someone learns to drive before passing his driving test.

A further extremely well presented teaching aid is the book *"Schulamateurfunk"* by DK3JI. To this must be added a whole series of books by amateurs dealing with the theoretical and operational aspects of amateur radio and designed for self-instruction. Unfortunately, the DARC has not yet found it possible to publish a reference work of this nature, as the German amateur radio organization is still not strong enough to employ its own team of technical experts as is, for example, the case with ARRL.

Despite all this, it can be maintained that German amateurs are doing their part towards insuring that the tradition of amateur radio is carried on within the definition of the ITU Radio Regulations, article 1 no. 78, which says:

> "*Amateur Service* – A service of self-training, intercommunication and technical investigations carried on by amateurs, that is by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest."

. . .DL1FL

LETTERS

NOV COV

Your November 73 cover is in very poor taste but does indicate the mentality of the staff of 73. Although I am not in agreement with Mr. Walker in many instances, amateur magazines are not the place for your kind of politics.

Jo Wood W1AYG

I do wonder where you think the place is for amateur radio politics if not in the ham magazines? Perhaps you are used to letting the government trod you into the ground and wish to just give up without a fight, whether you are right or not. Thank heavens not all amateurs are that willing to knuckle under. . . .wayne

IRS

I read about your battle with the IRS. I concur with everything you said. Can't see why our U.S. Senate allows the gestapo unit, IRS, to operate in the manner they do. You have my sympathy and I wish you the best and hope you come out of this smelling like a rose.

I know what you are going through. A few years ago I was in a small business and was checked by the IRS. I am bound to say they are the biggest bunch of liars, crooks, cheats and thieves I have ever had any dealing with.

You are doing a wonderful job with 73 for ham radio; also with the FCC for us hams. My hat is off to you and more power.

Enclosed is a stamped, self-addressed envelope for 4 copies of your news letter for my congressman and representatives. I sure will mail it to them.

name withheld (W4 - - -)

SIR

Your editorial is right in tune to the times! I hope you make out OK with the IRS; they need to be put in place.

Henry WA4HXZ
West Palm Beach FL

MORE IRS

As associate of mine (a ham radio operator) showed me the latest issue of your magazine 73, and I noted with interest your current problems with the IRS.

Liberty Lobby has sponsored a considerable number of Tax Protest meetings across the country and one of the results has been a book, published by us, and written by Dr. Martin Larson, our Tax Policy Consultant.

Dr. Larson has been fighting the IRS for about 30 years, and successfully. In the book he tells the story of other tax rebels, some of whom have gone to jail and some of whom have fought the IRS to a standstill.

I am sending you a copy of the book, *Tax Revolt, USA*, with my compliments. I know you will enjoy it and I hope it eases your mind some what to find that many others (about 13,000,000 according to the IRS) are refusing to bow to the excessive demands of the IRS.

Another reason we want you to have the book is because we have a club net, called the Liberty Net, which meets every Saturday with George W4BVU as our Net Control. Join us if you can.

Let me know if you feel we can be of service to you.

Robert M. Bartell
Los Angeles CA

ANONYMOUS LETTER

This letter is not for publication, but I want to point out that I am in complete concurrence with every word you have written.

Personally I am in the same spot as you except that they claimed a $40,000 error that they cannot prove, but do accuse me of, and they have "lost" 20 envelopes of records and countless checks. Do they apologize? No! An ex accountant who could not make it on his own is their expert auditor. I have been treated as though I were a criminal and subjected to constant insults. I have even had the same problem with lawyers as you.

I think that magazines and newspapers should publish the criticisms of the IRS and perhaps this would help to stop them using their powers as a weapon to discredit taxpayers. Do you think there are enough of us to act as a body?

name withheld (W7 - - -)

RIS

It's mighty refreshing to read the real journalism which I've seen in my recent subscription to 73.

Your tax difficulties show clearly that our country is getting into serious trouble.

You bet the IRS goes after the small guy! My *argument* with them involved $600 which I am unable to pay at this time. They wouldn't agree to payments of $30 per month (I make $125 a week); they wanted $50. Why? Because of the big fat savings account of $100 and the extravagant $5 per day which I spend for food, booze and cigarettes.

The $65 I paid a lawyer was an absolute waste. He sided with them, compromised my position, and won't refund the fees promised. He says I'm being "unreasonable." He also feels I'd be wasting my time writing my congressman, and that not enough money is involved to try for a two-year injunction.

Going after the small guy? And how! Walk into the waiting room of the Collection Division here in Washington and you won't see anybody who looks like they make even $100 a week. I was the only white person there! War on poverty, perhaps? Don't tell me this doesn't fatten the welfare rolls.

Using the power of an audit to stifle a free press? Right! There was a columnist in the Washington Star-News (formerly Evening Star) who wrote about these things. While I don't read the paper regularly, I can't seem to find this column any more. Funny about that, isn't it?

And how about the fundamentals? Didn't we *once* fight a war over this kind of taxation? Wasn't the income tax unconstitutional until passage of the 16th Amendment?

You can sign me up for this fight. I'm thinking of enclosing a couple of dead cockroaches with each of my payments.

More practically, I am prepared to distribute reprints of "73 a Little Thinner" in my apartment house (1700 tenants), at work (grade lessons for National Radio Institute), from the taxicab which I own and drive part-time, and possibly through the Washington Area Cab Drivers Association of which I am a member.

I hope that your office gets stacked right up to the roof with letters like this, and that somehow, we can stop this.

name withheld (W3 - - -)

CHC

Do you still have available the Certificate Hater's Certificate? I sure would like to have one. I hate ham certificates with equal malice toward all. I have been a ham since 1958 and I have never gotten any certificate from anybody in ham radio with the exception of your Life Subscriber Certificate, which I can't even find. I used to take it out of its grimy envelope and grimace at it once in a while, but I can't even do that any more. Frankly most of my hate involves hating other peoples' certificates, but this is normal since I don't have one of my own.

So please dig around and see if you can come up with one. It would be very impressive to hang up in my shack. Then when people come in to see all the expensive equipment that I use to talk to hams as far away as Liberty Lake (15 miles) with all the reliability and quality of a tin can on a

string, they can look at the CHC before they walk out shaking their heads.

John Kenney W7COI
Spokane WA

WANTS SB-110A

Can you help me? I've been looking for a year trying to find a used SB-110A. Every time they advertise one in QST I miss the boat because QST always seems to send me mine two weeks after it hits the stand.

Do you know anyone who would sell their SB-110A or havé any ideas?

D. R. Kight WA5RER
Box 212
Spencer OK 73084

MORE HELP

About 3 weeks ago I bought an E. H. Scott Co. "RCH" Radio Receiver Set and I would like to know if your readers know someone who has a manual. If there is any charge I will gladly pay. I want to get my receiver working. Thank you very much.

Scott Tonelson WN2LXN
217-37 Corbett Road
Bayside L.I. NY 11361

QSLs

After reading my October issue of 73, I gazed at the back cover in disbelief. QSL's for a penny apiece? Impossible! I read on and discovered it was true, it only makes sense that you could make them cheaper. The next day I told the kids in school that belong to our club and we decided to get them.

I am enclosing a facsimile order blank because I don't want to rip up my 73. Please send us our 500 right away. We would have ordered 2000 but our club is just now recovering financially from Field Day.

Bob Ternes WN8MQD
North Ridgeville OH

ANYONE STILL AROUND?

I was a Radio and Telegraph operator in France with the Radio Section Signal Corps First and Second Army. There must be some one of my pals who is still interested in radio. The only one I have met is a Frenchman who was a good friend during the time I was attached to the French 7th Army. Just thought that someone may see this.

Walter R. Lafferty W2GJH
119 Ayers Court, Teaneck NJ 07666

HELP DELAY

In obtaining some surplus electronic gear I have become the owner of a beautfiul piece of equipment called "Envelope Delay Test Set" Model 450B Mfg. by Sierra Electronic division of Philco-Ford. According to the manual it "measures envelope delay over a frequency range of 300 Hz to 110 kHz and in addition measures the frequency of the transmitted or received signal. Both the delay and the frequency measurements are displayed on individual direct reading digital readouts. Measurement of delay is made in either of three modes: end-to-end with return reference, loop-back, or end-to-end. The test set may also be used as a frequency counter of the range 1 Hz to 1 MHz.

It is comprised of a transmitter which generates a modulated carrier signal, a receiver which amplifies and demodulates the incoming signal, and logic and control circuits which process the envelope delay and frequency signals and which count and display the envelope delay and frequency information and convert it to analog form for external recording

It is mounted on a 5¼ inch panel and is all solid state with sixteen circuit boards and numerous integrated microcircuits.

This thing is too beautiful and sophisticated to cannabalize and appears to be in excellent condition. It looks like new and all the controls seem to work including the nixie tubes.

To someone somewhere this must be a valuable piece of equipment. If you can enlighten me as to who or what used it and why, it would be greatly appreciated.

Wayne O. Wallace, M.D. WØVPY
317 N. 3rd St.
Atchinson KS

OLD FRIENDS

When one ups and moves his home QTH, everything in sight gets packed and goes along. So it was when Sharon and I decided to move to Los Angeles. We put everything into those large movers' cartons, called Red Ball Van Lines, and then took off west in our Ford.

Little did I know the "nostalgia attack" that was to take place when we began to unpack. For within one of those aforementioned boxes I found my old 73 magazine collection, dating back to November of 1960 (37 cents, remember?)

I remember the first time I met you. It was the day when Larry WA2INM and John WA2FMF went "Little Red Wagon mobile" with a Gonset III, a 2m CushCraft Halo and 12V battery for power. That was 12 years ago.

I remember the very first article I ever had published. That was the review of the then new Clegg 99er in May of 1962. Boy, was it a great feeling to see it in print, even though it was far from being the epitome of amateur radio journalism.

May I call your attention to April 1962, page 64. It was Roy's article *FM to AM*. Perhaps, in light of today's trends, I should write a sequel entitled *AM to FM*.

Most of all I guess I remember that afternoon we all spent loading the U-Haul for your move from East 15th Street to Peterborough. I still find it hard to believe that the five of us loaded all that "stuff" into that truck. My back aches just to think of it.

It is sort of amazing to realize that all this time has gone by and how trends in ham radio have changed. SSB and FM have replaced AM on VHF, we now have an amateur satellite repeater and Novices can use VFO's.

Though I've lost track of most of the old 6m AM crowd, I'm still very close friends with John WA2FMF/6, Dave ex-WA2LFK and Larry WA2INM. John is now a Los Angeles policeman (also my landlord). Dave is a systems analyist in Albuquerque, and Larry now is sole owner of the business he and I started in Brooklyn four years ago.

If you print this, and if any of the old crowd from 6m in the 1960's read this, get in touch, because I'd love to hear from you.

In closing, let me say that we all change with time. 73 is now quite different than in 1960 or '61. But it is in keeping with the times, and I'm glad to see it. Especially the November cover.

Bill Pasternak WA2HVK/6
14732 Blythe St - 17
Panorama City CA 91204

PROSE

I have enjoyed your magazine for the few years that I have been getting it and am especially pleased about the recent articles about PROSE. Give him HELL, and don't let up 'til he knows that he isn't dealing with a bunch of kids. All this pushing around isn't necessary and damn well not appreciated.

I understand the FCC is fairly swamped with applications for repeater information and applications, but I don't think they are so busy as to allow an application for an amateur license to be as neglected as mine. Last June 17, after several communications with them, I sent them a check to cover the cost of reissuing my former call, which had been lapsed for 5 years or more, and I still have not received it. I got a letter from them saying that I would have a further communication and my old call back in two to three weeks. That was early October, and still no license, and no word.

I'd like to see more "home study" type things offered via cassette tape Maybe the higher class license material or some such other material.

J. Glen Skagerberg
Tujunga CA

OUTSIDE VIEW

As an outsider who probably hasn't the faintest idea what he is talking about, it seems to me that there are two types of amateurs currently on the air.

The first is like a sleepy old dog. He lays with his eyes closed and dreams of the good old days, and talks with all his old timer friends. He has finally saved enough for his dream rig and is content to enjoy it.

The second is the newcomer about my age, thirty; he has a little money to waste and is busy building all those gadgets with the integrated circuits and showing off his super power, digital read out, expensive portable to all the neighbors.

There is however a new dog on the block. He is the sleek purebred CB man. He has money and popular appeal on his side. In the words of a local CB'er, the FCC wouldn't dare to try to confiscate or fine them for being illegal. They have organized clubs and lots of money on their side, and if the FCC did get tough there would be such a howl in congress they would have to back down.

It seems to me that the radio amateurs of the United States had better wake up and start thinking more about the kids in school who are mildly interested in electronics before they give up and settle for an appliance and a CB license.

I happen to think a great deal of the hobby of amateur radio, but then I found out about it from a dedicated blind ham while still in grade school. I hope someday to teach my son, if there is any amateur radio left. I sometimes wonder if anyone caresany more. I just hope some of the hams out there do. I also hope to join them one of these days soon.

Thank you for reading this and helping me get it off my chest.

Vernon R. Wheeler
Denver CO

WALKER

Just wanted to let you know I have written Georgia Senator Sam Nunn and Barry Goldwater. Got a very interesting letter back from Sam Nunn. Seems he's going to do some talking on behalf of us hams here in Georgia concerning A. Prose Walker. I was surprised to find that old boy ain't so far up on the totem pole at the Federal Candy Company as I thought he was.

I have a suggestion for ole Walker — he should stick his finger in a bucket of water. If there is a hole left when he pulls it out it will prove he is indispensable. Otherwise he had better shape up!

Marvin Banister K4PGY
Albany GA

DEFENSE PROSE

The radio amateurs should take a realistic look at the FCC and Mr. Walker before they tear Mr. Walker apart. For instance, if you were a businessman and could sell 250,000 items for $9.00 each or 250,000 items for $20.00 each what would you do? Our government has issued directives to its agencies ordering a cutback in spending and an increase in agency income. Mr. Walker has no doubt received such a directive from the FCC Commissioners. What else is he to do than follow the directive?

The radio amateurs must realize to get power in Washington they must have a professional lobby to represent them. Presently the League is too interested in selling magazines to fully represent the amateurs. If the radio amateurs were to hire a professional lobby we would no doubt receive the goals the amateurs are seeking.

The CBers have done this and have gotten many of the goals they were seeking. I'm not for the CBers, but the amateurs should take a lesson from them and get a professional lobby in Washington to represent amateur radio.

Ken Anderson K7LDZ
Great Falls MT

BURMA

I was from Burma; an oldtimer having got the amateur license in 1928. My call was XZ2AD. Owing to the ceasing of operation of my Company — the American International Underwriters Branch Office in Burma when the Military Revolutionary Government came into power, I left the country with the family and now am trying to get settled in the U.S.

Recently I took the exam and got WA6SNC, as a result of Goldwater's legislation.

I worked hundreds of stations of USA from Burma and those who haven't received my QSL can claim now.

U Hla Oung WA6SNC, Ex XZ2AD
995 Pine St., No. 502
San Francisco CA 94108

JORDAN

Let me compliment you on the September issue of 73. Those pictures and the story of your trip to Jordan were just out of this world. Only wish I could have been with you. I am sure if all the hams that have read your article knew of a central location that they could send their left over and surplus equipment for delivery to Jordan you would soon have a plane load.

John Petrow W2GHY
Medford NY

Send it to us marked "FOR JORDAN."

KA SSTV

I am stationed in Japan, have been here for a number of years and hope to be returning home within the year. My call is KA2AI and was recently a member of the DX-pedition to KA1CQ on Iwo Jima. There are a couple of KA's now active on SSTV, KA2DF, DA2RG and myself. I run a KW on SSTV on 20m daily and am looking for any stateside video I can find. I wish the guys back there would turn their antennas northwest and look for us! I am using JA "HAMVISION" equipment, both camera and monitor.

Samuel S. Yates KA2AI, K4KAI

METRIC RULES!

I think it is great that you have gone metric in your articles. The big problem for antenna builders is to find a metric rule or tape over 30.5cm (12") long. On a trip to Guatemala I was able to buy a 2m folding rule (STANLEY No.714 M-E) and a 3M tape (STANLEY P3ME) both made in the USA. I wonder now if they can be purchased here?

Once you start using a metric rule for home carpentry you will wonder why anyone insists on using inches or feet with the complicated fractions. Try adding a 17 3/16" length to a 6 3/4" measurement without making an error. Then try 47cm plus 18cm. The odds of an error are greatly reduced.

Keep with the metric measurements and you will have your readers trained to think metric in a short time.

Richard I. Haxton WA3IVB
Boyds MD

LISTENING .73–.84

It's a beautiful Christmas day, everyone has opened their presents, but you find you need some milk and eggs for breakfast. You look out the front window and the "OK TO DRIVE" indicator is flashing green. So you proceed to drive to the store a few miles away. On your way, you wave to the sentries in their cubicles placed at strategic positions to nab you if you commit any infraction of the law. You drive quickly (as legally possible) to the store. You park, run in and out, jump into your car to find the red light flashing on the dash."NO DRIVING." So there you are, stuck and no way to get home. You reach for your car phone to find out what's up. The reply goes something like this, "Because of the lack of traffic, the sentries have been sent home to be with their families on this day of peace. No one drives the streets without someone watching."

It's just a story, but it seems that this is the situation with repeaters. The repeater is turned off when control goes to the bathroom or wants to be with the wife. I would be willing to bet that there are few repeaters that are operated quite this way. Just think, FCC, if they were, you would have a lot of mail to pour through. I feel that very strict controls on repeaters will bring a response from the ham public, which we need to keep from being walked on.

1984 is here in 1973 — My, how time flies when you're having fun.

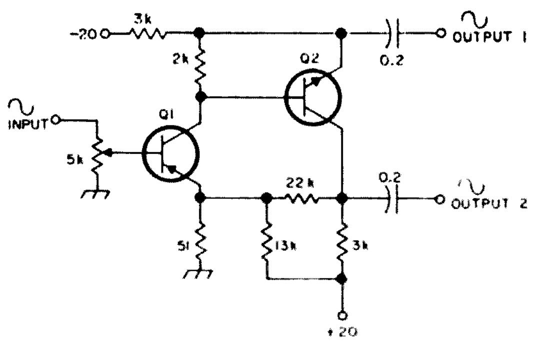
John Ellingson K7OSK
Rochester WA

Let's see what happens in '74 . . .

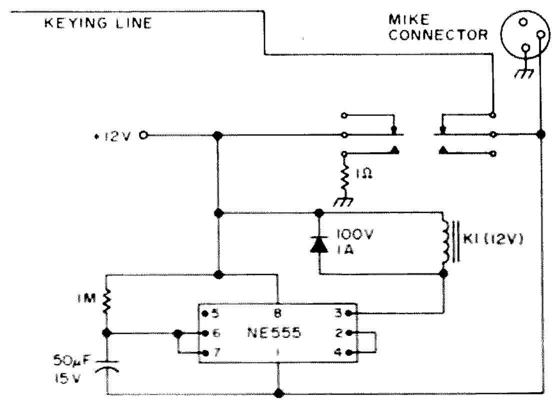
CIRCUITS, CIRCUITS, CIRCUITS. . .

The following circuits have appeared in the referenced books, magazines, application notes, etc. While we try to reproduce all of the information that should be needed by an experienced constructor, readers may want to avail themselves of the original sources for peace of mind.

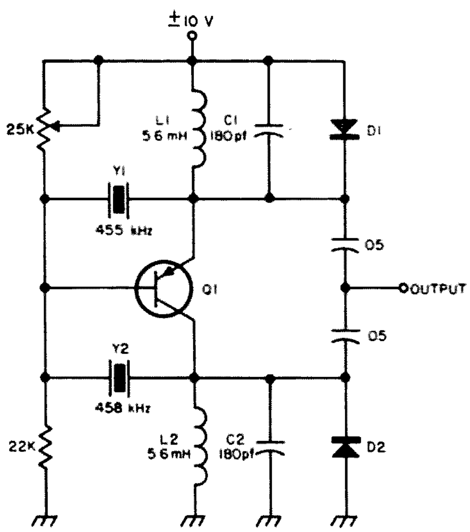
Readers are requested to pass along any interesting circuits that they discover in sources other than U.S. ham magazines. Circuits should be oriented toward amateur radio and experimentation rather than industrial or computer technology. Submit circuit with all parts values on it, a very brief explanation of the circuit and any additional parts information required, give the source and a note of permission to reprint from the copyright holder, if any, and the reward for a published circuit will be a choice of a 73 book. Send your circuits to 73 Circuits Page, 73 Magazine, Peterborough NH 03458.



This phase splitting circuit provides two out of phase signals for driving a push pull amplifier without an expensive transformer. The gain of the stage as shown is 150, but this may be adjusted by changing the value of the 22K feedback resistor. Q1 and Q2 are a complimentary pair such as the 2N652 and 2N388 or 2N2430 and 2N2706.

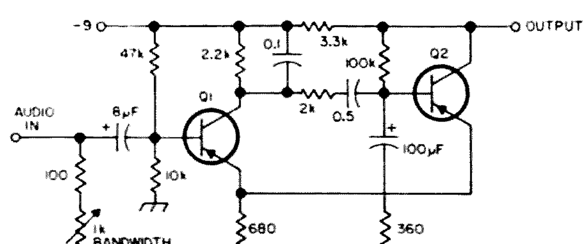


A timeout timer that shuts off your rig before you close down the repeater. With the values shown your rig will turn off after 1 min. 59 sec. The 1Ω resistor is wired in as a joke (build one of these for a friend!) as it will provide a "sniffable" indication of the rig's shut-down.

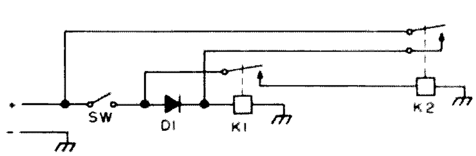


Q1- 2N384, 2N525, SK3004, TI-XM03
D1,D2- GENERAL PURPOSE SILICON DIODES

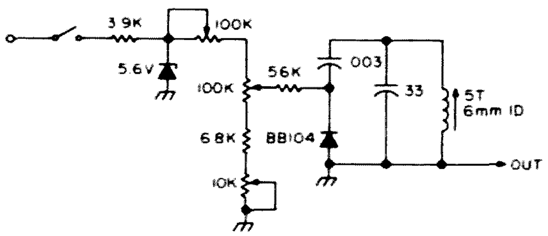
This two frequency crystal oscillator changes frequency by simply reversing the supply voltage. When the supply voltage is changed the transistor inverts itself; usually transistors may not be used in the inverted mode, but in an oscillator a gain of only 1 or 2 is needed and this circuit provides a novel and simple way of obtaining two frequencies from a single stage with a minimum of switching. Q1 – SK3004 D2 & 2 – silicon.



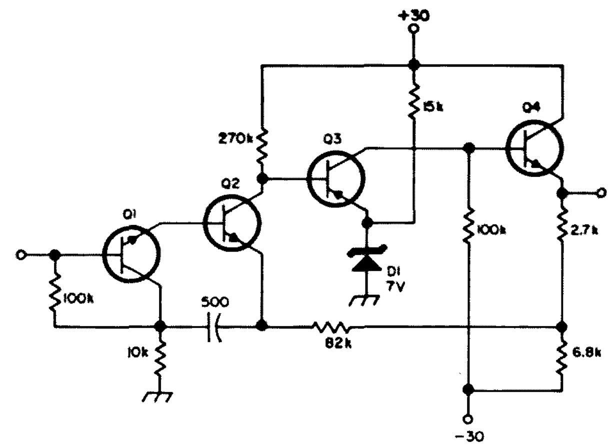
This audio filter uses a 1000 Hz Wien bridge circuit to provide bandwidths from 70 to 600 Hz wide Q1 and Q2 are SK3004, GE-2 or HEP-254.



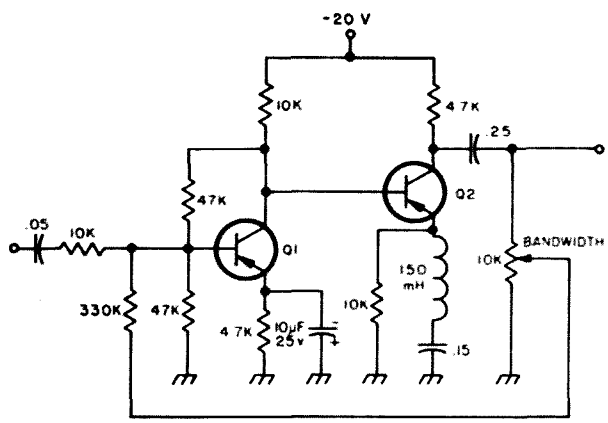
This circuit is handy for pentode or tetrode power amplifiers. Relay K1 switches on first and off last, K2 switches on last and off first. K1 controls plate voltage and K2 controls screen voltage. Thanks to W8UFN.



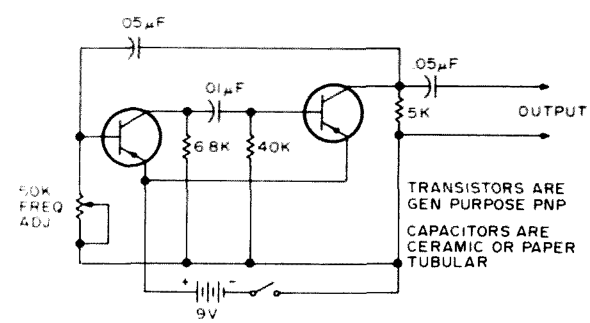
A 12 MHz VFO adapter for the TR22 that can be plugged into its crystal socket. After applying +12V to the switch terminal, the unit can be tuned via the 10K variable resistor. The two 100K units determine bandset and linearity.



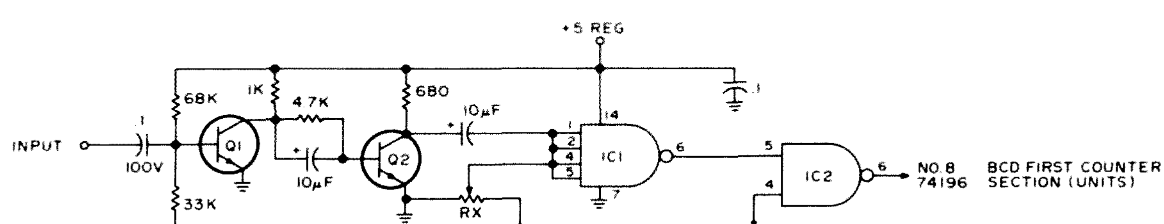
This preamplifier provides 11 dB gain from 0.5 Hz to 2 MHz and has an input impedance of 32 megohms. Transistors Q1, Q2 and Q4 are SK3020 or HEP-53; Q3 is a GE-2 or HEP-52.



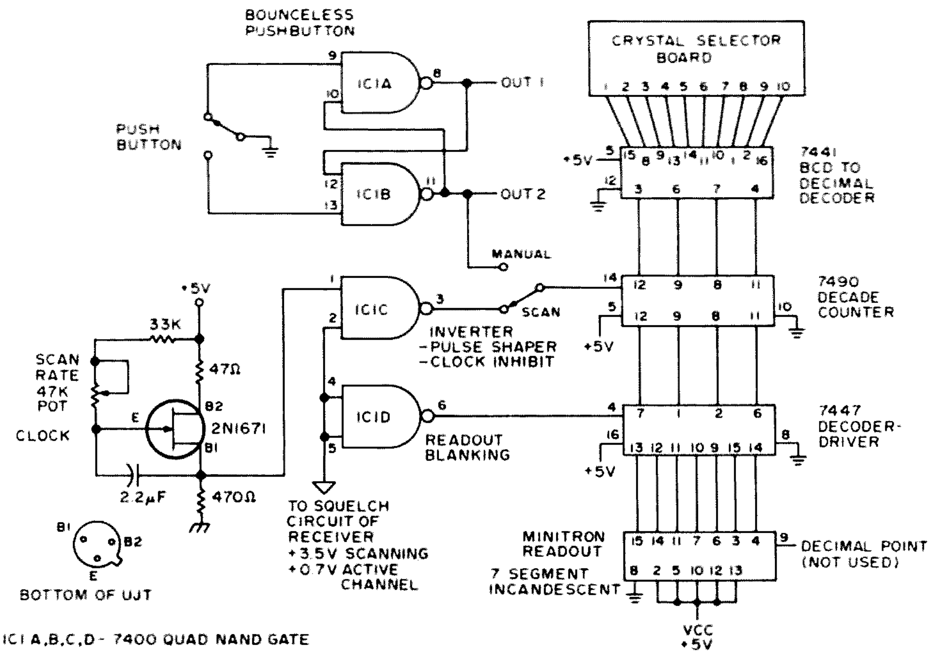
This simple audio bandpass filter may be narrowed to the limits of unintelligibility. At a bandwidth of 80 Hz, it provides about 20 dB gain The input is connected to the phone jack on your receiver while headphones are connected across the output. Q1, Q2 – SK3004.



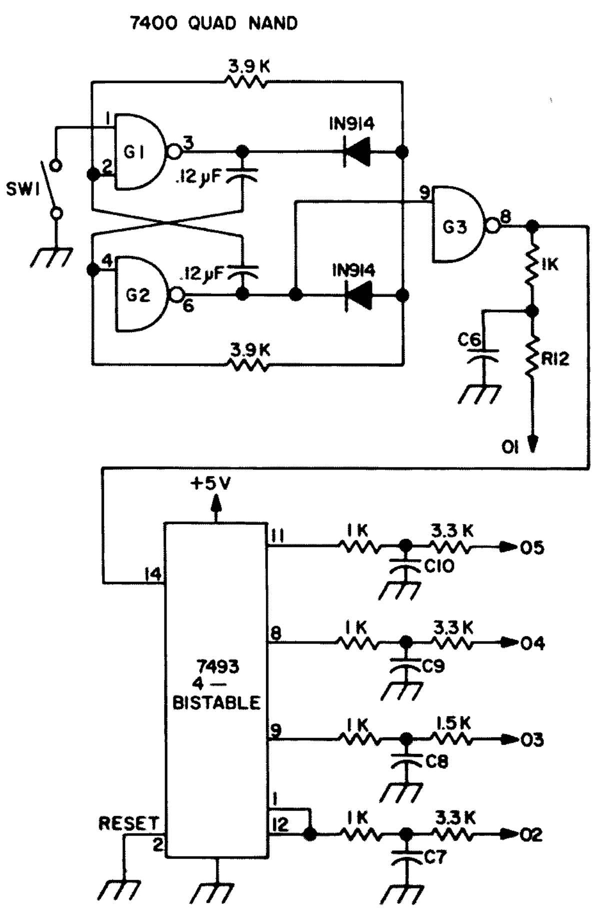
An audio signal generator for checking modulators, audio amps and bandpass filters. Thanks to WA3SWS.

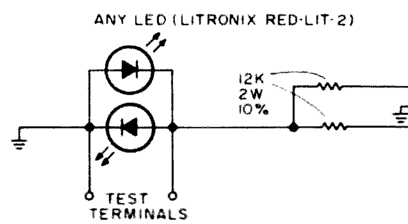


A counter input circuit. This input circuit has operated from 450 kHz to 65 MHz. Sensitivity about 50 mV. For some reason it will not read audio frequencies. Rx is 5K ohms. It should be adjusted to trigger the 7413 at the highest frequency It would be better to measure each side of center tap after adjustment and use two fixed values and variable of only 100 to 200 ohms. The + voltage on pins 1,2,4,5 of the 7413 will be between 1.2 and 1.4V, but it does have to be adjusted right on the trigger threshold for highest frequency operation I used Ken Macleish's logic and control circuits in my counter and only 5 digits, with a change in timing and decimal point. I tried three or four 7413's and they all counted to 65 MHz. A 7490 won't do it – you must use a 74196 or 8290 in the first counter section. The 74196/8290 and 7490 are not interchangable, the 74196 clears on a negative going pulse, a 7404 will take care of that. Q1,2 – any 600 MHz NPN. IC1-7413. IC2-¼ 74H00 gate. Thanks to W5HCO.



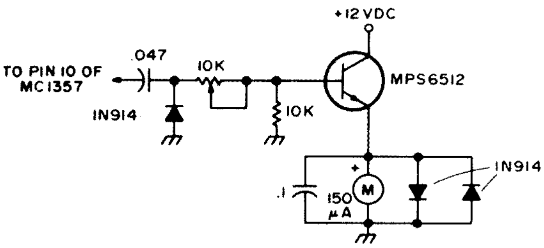
Integrated circuit channel scanner: This unit is capable of scanning a series of channels in a receiver by switching crystals in and out of the first oscillator. It works like this: A UJT is used as a clock to produce a series of pulses. This particular UJT is fairly expensive ($2 to $3) but it operates well on 5V. The pulses are of the wrong polarity and quite noisy To correct both situations, they are fed into one gate of a quad two-input NAND gate, a 7400. The output of this gate is connected through a switch and thence to the counter. Note: bypass 5V supply frequently with .01 to .1 μF. Thanks to VE7BH4.



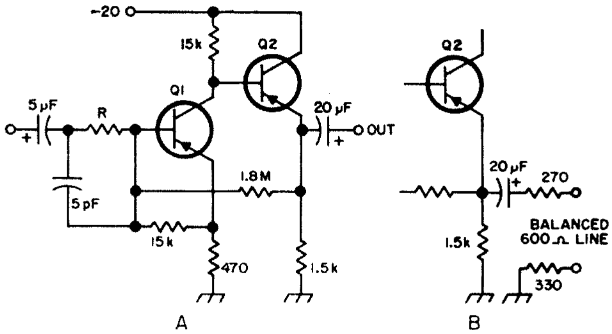


This super simple diode checker using LEDs will check the polarity and condition of diodes. Thanks to Noel Calvin

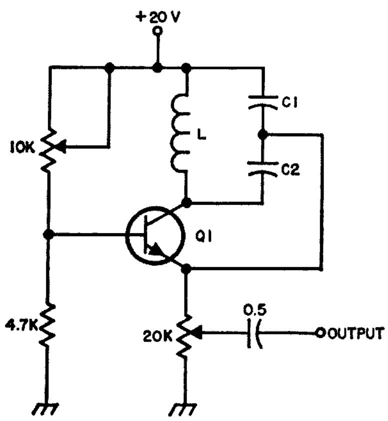
This frequency dividing signal source gives four X2 submultiple outputs of the frequency at 01, or five different harmonically related outputs from a signal oscillator. To change the fundamental frequency of the oscillator replace the two 3 9k resistors and the cross-connected capacitors with values calculated according to 1.6/RC, with R in ohms and C in farads. R12 should be varied to make the 01 output match the divided outputs. The capacitors C6–10 are optional and can be added to reduce the harmonic content of each output. They are chosen so their reactance equals 1k at the output frequency. From "Handbook of IC Projects," by Tab Books.



An S-meter circuit for Regnecy FM rigs.



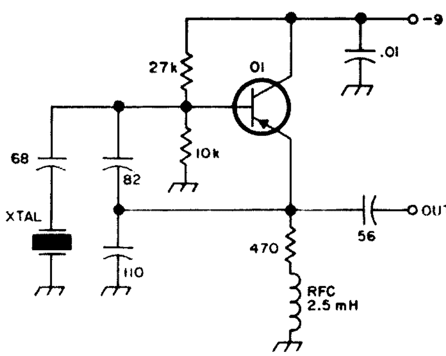
High impedance preamplifier provides up to 1.2 megohms input impedance; the exact value depends upon the build out resistor R. Both Q1 and Q2 should be a DK3004, GE-2 or HEP-254 A balanced output for reduced hum and noise may be obtained by using the padded output in B.



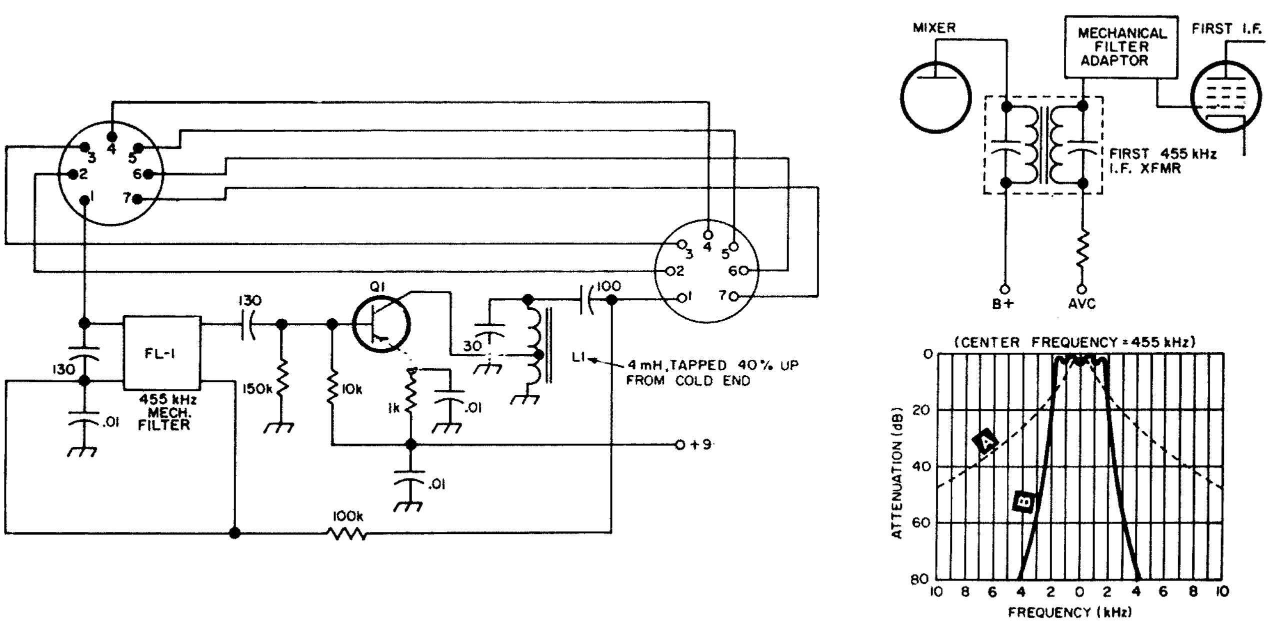
Q1 - 2N2925, 2N3392

FREQUENCY	C1	C2	L
50 kHz	3500 pf	1500 pf	10 mH
80 kHz	2200 pf	910 pf	6.2 mH
100 kHz	1800 pf	750 pf	4.7 mH
200 kHz	910 pf	390 pf	2.2 mH
455 kHz	390 pf	160 pf	1 mH
1000 kHz	180 pf	75 pf	0.47 mH

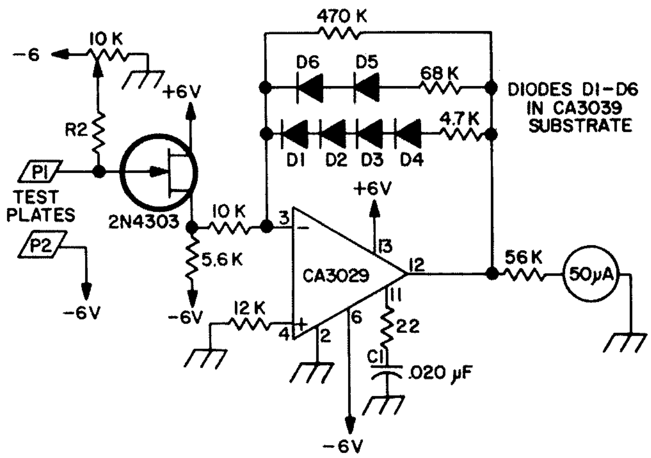
This simple circuit provides an extremely stable BFO. The frequency of oscillation may be tailored to your needs by simply choosing the proper tank components listed in the table.



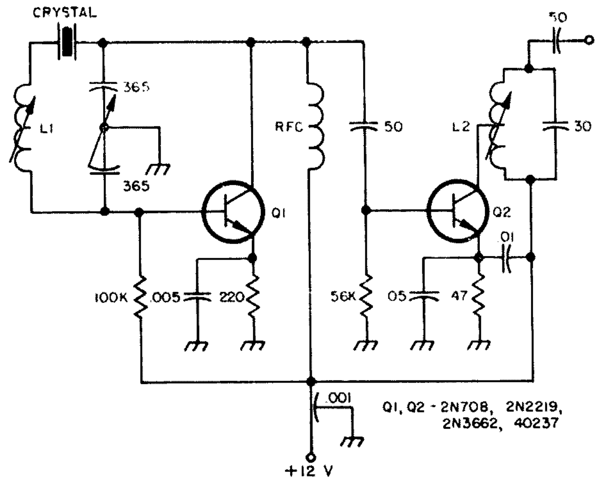
This crystal oscillator will oscillate with any crystal between 3 and 20 MHz with no tuning whatsoever; overtone crystals will oscilate on their fundamental in this circuit. Q1 is a GE-9, SK3006 or HEP-2.



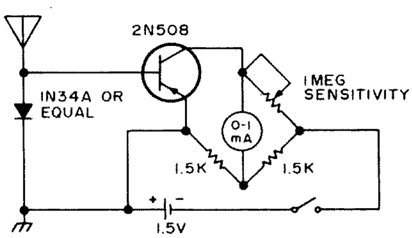
The selectivity of inexpensive communications receivers may be substantially increased by the addition of this mechanical filter adapter. The transistor is used to make up for the 10 dB loss through the filter. The typical passband of a receiver without the filter is shown by A in the frequency response curve; the mechanical filter adapter results in curve B. Q1 should be a SK3008 or HEP-3.



A conductivity checker that will easily find a home in anyone's darkroom. With the test plates immersed in a flowing-bath print washer, the meter will indicate a lowering amount of conductivity as the hypo is washed away from the prints. When the meter indication approaches the measurement obtained from pure water, the prints or film will be nearly hypo-free. From "Handbook of IC Circuit Projects," by Tab Books.



This variable crystal oscillator (VXO) may be used to vary the frequency of an 8 MHz crystal 4 or 5 kHz when the 365 pF dual variable is tuned through its range. When multiplied to two meters or 432, this provides a very stable variable frequency. For 8 MHz crystals, L1 is a 20—25 uH slug tuned coil; L2 is chosen to resonate at 8 MHz with the 30 pF capacitor.

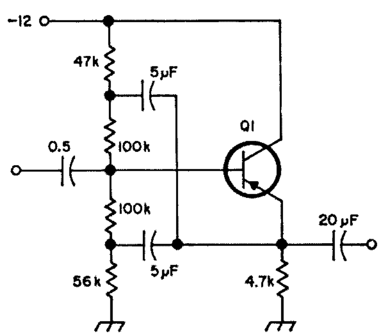


A general purpose field strength meter for checking antenna performance. Thanks to WA3SWS.

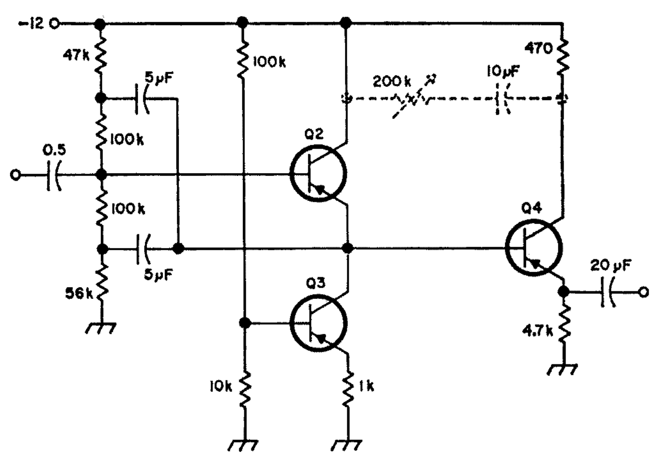
Table 1

Crystal	**L₁**		**L₂***
3.5 MHz	35-60 μH	Miller 4509	80 turns #36, tapped at 27 turns
5.0 MHz	24-35 μH	Miller 4508	62 turns #36, tapped at 21 turns
8.0 MHz	16-24 μH	Miller 4507	40 turns #36, tapped at 13 turns
9.0 MHz	16-24 μH	Miller 4507	36 turns #36, tapped at 12 turns

*Wound on ¼" slug tuned form.



(A)

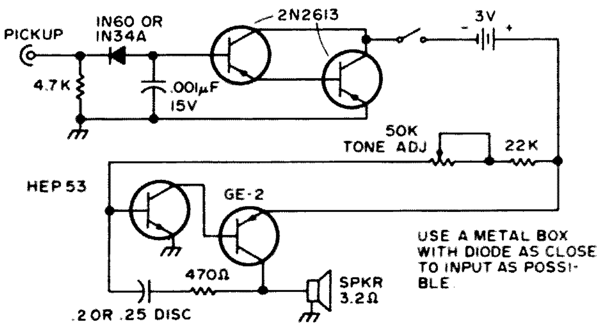


(B)

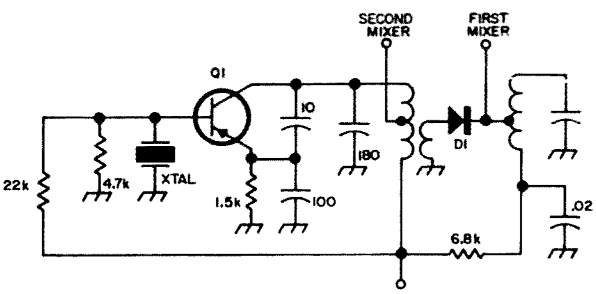
This high impedance preamplifier provides up to 20 megohms input impedance and has a frequency ressponse from 10 Hz to 200 kHz. Circuit B was developed from circuit A by replacing the emitter resistor in A with Q3 and adding an emitter follower to reduce loading The input impedance is further increased by the components shown by the dashed line. All transistors are SK3005, GE-9 or HEP-2.

Continued on p. 177

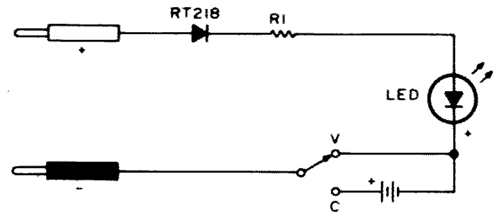
MORE CIRCUITS . . .



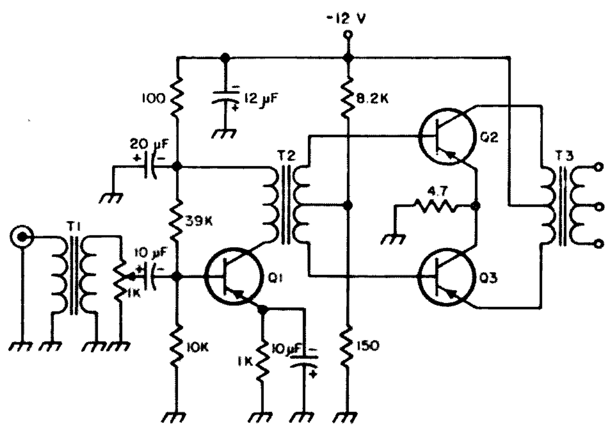
A wireless CW monitor that needs only to be placed near a source of rf to operate. Thanks to WA3SWS.



Single oscillator and diode provide two injection frequencies for dual conversion receivers. Transistor Q1 is a GE-9 or HEP-2 the diodes should be a 1N82A or similar.

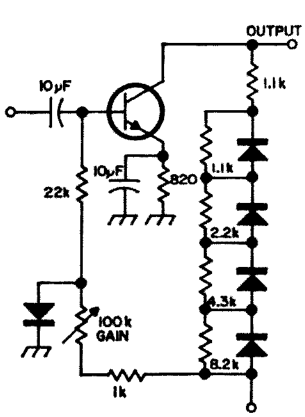


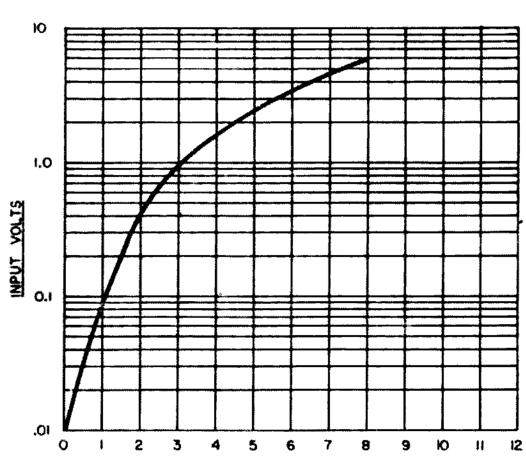
A LED continuity and voltage tester, when the switch is in the V position the presence of a voltage and its polarity is indicated The C position converts the unit into a continuity checker. R1=470Ω, LED=ED150 or ED155 and the battery is a 9V transistor type. Thanks to Sprague Products Co.



Q1, Q2, Q3	2N109, 2N2613, 2N2953, SK3004
T1	25K : 1200 OHMS
T2	20K : 2K OHMS CT
T3	5K CT : 200 OHMS CT

This 100 mW modulator may be used to collector modulate transmitters up to about 200 mW or to base modulate somewhat larger power amplifiers. Good performance with a minimum of components is obtained by transformer coupling between stages.





This simple dynamic range compressor provides more than 50 dB range; it exhibits gain with a 20 millivolt signal but will not saturate with input voltages up to 6 or 7 volts. All the diodes are IN914; transistor Q1 should be a SK3010 GE-8 or HEP-54.

PROPAGATION CHART
J.H. Nelson
Good (Open) Fair (□) Poor (O)

January 1974

SUN	MON	TUES	WED	THUR	FRI	SAT
		1	$\boxed{2}$	$\boxed{3}$	$\boxed{4}$	5
6	7	8	9	10	11	12
13	14	15	16	17	$\boxed{18}$	$\boxed{19}$
20	21	22	23	$\boxed{24}$	$\boxed{25}$	$\boxed{26}$
27	$\boxed{28}$	$\boxed{29}$	$\boxed{30}$	31		

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	3	3	3	3	3	7	14	14A	14
ARGENTINA	14	7	7	7	7	7	14	14A	14	14	14A	14
AUSTRALIA	14	7B	7B	7B	7	7	3A	7	14	14	14	14
CANAL ZONE	14	7	7	7	7	7	7	14	21	21	21	14
ENGLAND	7	3A	3A	3	3	3	7A	14A	14A	14	7	7
HAWAII	14	7B	7	3A	7	7	3	3	7B	14	21	21
INDIA	7	7	7B	3B	3B	3B	7	14	7B	7B	7	7
JAPAN	14	7B	7	3A	3	3	3	7	7	3A	7	7A
MEXICO	14	7	7	7	7	7	7	14	14	14A	14A	14
PHILIPPINES	14B	7B	7B	3B	3B	3	3	7	7	7	3B	7
PUERTO RICO	7	7	7	7	7	3	7	14	14	14	14	14
SOUTH AFRICA	7	7	7	7	7	7	14	21	21	14A	14	14
U. S. S. R.	3	3	3	3	3	3B	7A	14	7A	7B	3B	3
WEST COAST	14	7	7	7	7	7	3	7	14	14A	21	14A

CENTRAL UNITED STATES TO:

ALASKA	14	7	7	3	3	3	3	3	7	14	14A	14A
ARGENTINA	14	7	7	7	7	7	7	14	14	14	14A	14A
AUSTRALIA	14A	14	7B	7B	7	7	3A	7	14	14	14	14
CANAL ZONE	14	7	7	7	7	7	7	14	21	21	21	21
ENGLAND	7	3A	3A	3	3	3	7	14	14	14	7	7
HAWAII	14	14	7	7	7	7	7	3	7	14	21	21
INDIA	7	7	7B	3B	3B	3B	3B	7	7	7	7B	7
JAPAN	14	7B	7	3A	3	3	3	3	14	14	14	14
MEXICO	14	7	3	3	3	3	3	7	14	14	14	14
PHILIPPINES	14	7B	7B	3B	3	3	3	3	7	7	3B	7
PUERTO RICO	14	7	7	7	7	3	7	14	14	14A	14A	14
SOUTH AFRICA	14	7	7	7	7	3B	7	14	14A	14	14	14
U. S. S. R.	3	3	3	3	3	3	3	7A	7A	7	3B	3B

WESTERN UNITED STATES TO:

ALASKA	14	7A	7	3	3	3	3	3	7	7A	14	14
ARGENTINA	14	14	7	7	7	7	7	7A	14	14	14A	14A
AUSTRALIA	14A	14A	14	7B	7	7	7	3A	7	14	14	14
CANAL ZONE	14	7A	7	7	7	7	3A	14	14	21	21	21
ENGLAND	7	3A	3A	3	3	3	3	7	14	14	7B	7B
HAWAII	21	14	14	7	7	7	7	3	7	14	21	21
INDIA	7	14	7B	3B	3B	3B	3B	3A	7	7	7	7B
JAPAN	14A	14	7	3A	3	3	3	3A	7	3A	7	14
MEXICO	14	7	7	7	7	7	3	7	14	14	14A	14
PHILIPPINES	14A	14	7B	3B	3B	3	3	3	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7	14	14	21	21	14
SOUTH AFRICA	14	7	7	3A	7	7	3B	7A	14	14	14	14
U. S. S. R.	3	3	3	3	3	3	3	3	7A	7	3B	3B
EAST COAST	14	7	7	7	7	7	3	7	14	14A	21	14A

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

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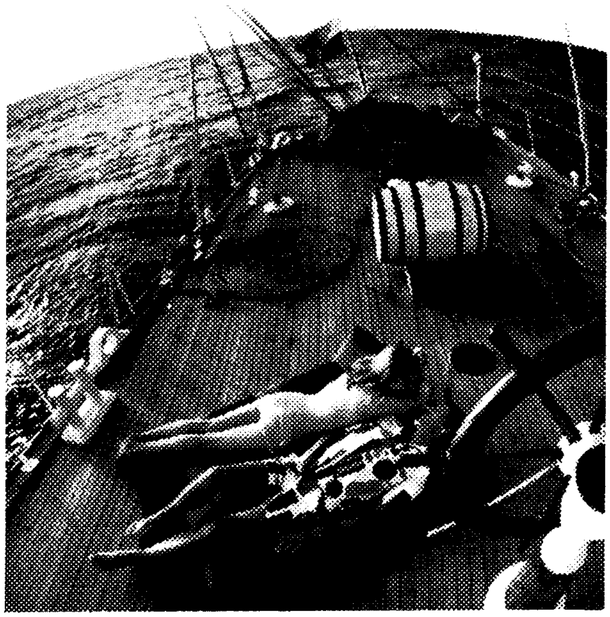

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for radio amateurs

#161 FEBRUARY 1974

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...de W2NSD/1

EDITORIAL BY WAYNE GREEN

IRS

It took quite a bit to get my attention, but now the IRS has definitely got my attention and, if you're interested, I'll pass along some of the fascinatng things that I've been finding out about them. Some of the stories are right out of the Nazi storm trooper notebooks.

In addition to the tales of horror of persecution by the IRS there are the stories of brave people who have been standing up to these tyrants and winning. I didn't realize that thousands upon thousands of people have been in revolt against the income tax... successfully! I'll be looking more and more into this phase and reporting back to you...if you're interested.

I think that all of us are honest enough to agree that we should pay our share of the cost of running our town, our state and our country. I think most of us feel that these things are not being run very efficiently at present and are unhappy over the whole situation. I've read some interesting proposals for alternates to the income tax. There are enough different ideas — some of them very good — on better ways to pay for the services we need so I can sympathize with many of the people who are in revot against the present system.

Many people are quite angry about continuing tax loopholes which permit people and businesses which you might expect to be helping to pay for the country to run to pay little or no taxes. Did you know that the middle income people pay over 80% of the income taxes? Did you know that 71.4% of the tax income of the government for 1973 came from income and social security taxes — out of your paycheck? Corporation taxes furnish only 16.1% of receipts! There *must* be some better system than this!

IRS HARRASMENT

One of the "witnesses" in the trumped-up case against 73 Magazine called recently to tell a story of how the IRS needlessly forced him to lose a $25,000 business deal. Does he have any recourse against the IRS special agent for this lost income? Of course not.

Briefly, this person sold a small item to 73 Magazine several years ago which the special agent decided he would disallow as a business expense. The purpose of the "witness" was to prove that 73 Magazine did indeed buy the item. 73's counsel offered to stipulate that 73 did indeed purchase the item so that it would be completely unnecessary for the "witness" to testify. The special agent, apparently much more interested in having a host of unneeded witnesses to impress a jury and to carry out the Taxpayer Compliance Program refused to accept the stipulation or to let the witness leave the country to make his business deal. This shows the callous disregard for the taxpayers that this special agent has.

Whether the item in question should have been disallowed or not is not relevant to this witness and his personal loss. It was just a small thing that was used for decoration of the 73 Magazine waiting room and it was sold when the room was redecorated... sold for the same price that was paid for it.

BEWARE OF TAX REFUNDS

One of the things that can flag an IRS audit is a substantial tax refund. Since there is virtually no way to go through an audit without it costing you money, it should be obvious that an audit is to be avoided like a swim in the rapids of the Colorado River.

This is an interesting piece of news for people who understate their dependents on their withholding as a form of enforced savings. Then they claim the right number of dependents at tax time and get the difference in withholding tax. They also stand a big chance of an audit which will lose them everything they saved and more.

Just how much does the IRS take away from you as a result of an audit? The *average* for 1973 on taxpayer audits was $796 each! Perhaps you can see why an audit is to be avoided if at all possible. Add to that $800 your cost in lost time at work and the wear and tear on your ulcers.

The IRS can't audit all returns, of course, so they pick out about two million to get the works. If your number comes up you are in for a big headache. About $800 worth, on the average. Of course the chances are that you are a little above average in income, so you'll get hit even harder. The average amateur should assay out to about $926.

How do you win the golden ante award? Assuming that you are not singled out by the administration to be screwed, or by a vindictive governor, or by a business competitor with political pull, and you're not a journalist who needs the fear of God put in him, or a judge or other person against whom the IRS has a vendetta, then all you have to worry about is not having the big IRS computer light up tilt when your form is processed.

The computer is programmed to balk when certain standards of deductions are exceeded. If you overdo on medical expenses, for instance, you're up for an audit. It makes no difference that your expenses were completely legitimate. The computer only knows that you deducted more than was set as "reasonable" by the IRS. The IRS figures of what is reasonable are very closely guarded for if they were known the taxpayers could take the limit of reasonable deductions and save a whole lot of money.

Once your return has been rejected by the computer you stand a good chance of being in for an audit and a nice big bill. Worse than that, once you've been hit for an extra payment, you are a pidgeon and you can expect to have them looking to you for continued big profits in the future. These are called "subsequent audits" and are a goldmine for the IRS. In the last few months of 1972 the IRS picked up an average of almost $4000 each from 13 thousand people in this group.

They also do a rousing business with this group in going over their back returns and figure that this yields about $5000 per man hour spent on that.

Obviously it is extremely important not to have your return light up tilt.

One more statistic for you...in 1973 the people who asked for substantial refunds ended up paying an average additional tax of $234! That's right, not only didn't they get their expected refund, they had to shell out a bundle.

How can such a thing be, you are asking? Very simple, your revenue agent knows all the tricks with the tax returns and you don't. He not only makes this sort of extortion his business...and his progress within the IRS depends to a large degree on how much he brings in...the rules he goes by are unavailable to you...they're secret. All else failing, he can blithely disallow any deductions he wants, and what are you going to do about it? If you don't pay, he can come to your house and take your car, your son's car, your watch, etc., and put them up for public auction. You may even find yourself ridiculed in the newspapers in an ad for the sale of your confiscated

property as one California chap did.

Don't make waves if you don't want trouble with the IRS.

On the other hand, there is a growing number of people who are intentionally making waves. . .and with some success. . .revolting against the IRS.

TAX REVOLT

The people who have been leading the way toward a revolt against the IRS and the whole tax system have worked out some interesting ways of doing things. I'm not sure how well they are getting away with it, but the claims are that no one has yet gone to prison that has done it just right.

One of the basics seems to be a matter of crossing out the perjury statement on the tax return. If you stop and think about it, there should be a Miranda warning right there above that perjury statement for it is truly said that you are signing a ticket to jail when you sign the tax form. You already know that no two IRS agents filling out the same tax form come up with the same results. Several newspapers have exposed this in tests, much to the embarrassment of the IRS. You also know that the IRS can put almost anyone they want in jail for fraud on the basis of their tax returns, no matter how honest they were.

When you sign that return you are guaranteeing that it is accurate and complete and there is no possible way for you to know that. . .so you are lying when you sign it and you are immediately up for grabs, if they want you.

The tax revolt people cross out the perjury statement on the return, thereby making the job of the IRS extremely difficult if not impossible when it comes to prosecuting them, if it ever comes to that.

Another group has been trying to make headway via the route of pointing out that it is unconstitutional for the IRS, which is part of the executive branch of the government, to confiscate property without going through the judicial branch of the government. . .with no court order, etc. The fact that the protesters appear to be clearly right has not yet enabled them to win. Chalk up one more to the incredible power of the IRS. . .even the United States Constitution has not been able to stop them.

One of the major problems with regard to tax revolt is that it depends entirely upon little people and they don't have the resources to put up much of a fight. The big corporations like the present system. . .after all, they don't have to pay much in taxes, so why should they rock the boat? The big load is on the middle income taxpayer and the small businessman, the ones that can't afford to fight.

IRS & YOU?

If you've had any QRM from the IRS you might send along some details . . . we'll keep your name confidential. The best way to get this bunch of pirates to shape up is to put the spotlight on them and expose their methods. Let's back them down.

MORE?

The more research I do the more horrified I am at the callous lengths some IRS agents have gone in harrassing people who were unable to buck their raw power. If you'd like to here more about this and the ways people are fighting back, just give me some encouragement.

MIDEAST TENSIONS

As long as the mideast is as tense as it is, even though it is entirely safe to visit Jordan, it seems likely that many amateurs will want to wait for things to cool down in the neighboring countries. Thus, reluctantly, it has been decided to delay our ham tour to Jordan until fall, hoping that some solutions to the problems will have been found by that time.

During the war between Israel, Egypt and Syria there was little disturbance in Jordan. Amateur radio continued without interruption, as did everything else. There was some nervousness because of the nearness of the conflict, of course. It is interesting that the border between Israel and Jordan remained open throughout the war.

And, lest you forget what a fantastic experience you will have visiting Jordan, here is a photo of Martha Blackburn, the wife of Blackie JY9BB, with Lin (my wife), eating at the beautiful and clean restaurant at Karak with the head of the boy's club and Hisham JY5HA.

We have some late news from Amman . . . it seems that the repeater I brought over in June and helped set up has been popular and a second repeater is being installed. Quite a few hand transceivers have been purchased, so activity will be increasing there.

Hisham writes that a new class for beginning hams will be starting in January and a large number of youngsters are already signed up . . . so look for more and more active hams in Jordan.

Several U.S. amateurs have already packed up some unused gear and sent it along to the embassy in Washington to be forwarded to the clubs in Jordan. If you have any good equipment that you want to offer to some kids that will very much appreciate it, this is a good route to go. The address is: Embassy of Jordan, 2319 Wyoming Ave., N.W., Washington DC. Let's get these great kids some rigs, some receivers, and parts for building and experimenting.

NON-HAM SCM ELECTED!

A note from a reader out in Nevada brings fascinating news of the ARRL and its election of Leonard Norman as SCM. Norman is the chap who runs the yearly Saroc ripoff.

The FCC called up Norman, who had a Conditional license, for re-exam in July 1972 and he failed *both* the General and Technician exams. Though ARRL HQ knew Norman had failed both license tests they still ran him for SCM in the September election, where he beat out W7SJR by only 17 votes.

When word of Norman losing his license got to the local League membership, Norman was finally forced to resign. Norman appointed his buddy K7ZOK at SCM, thus finessing W7SJR out of the job.

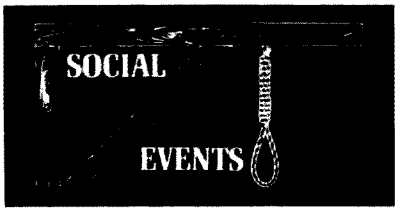
This is all fact, backed up by letters from Walker testifying that Norman had failed the exams, and from Huntoon saying he knew that Norman had failed, but that since Norman had not yet surrendered his license to the FCC, he was still eligible to run for SCM.

FCC LIMITATIONS

A letter from a reader out in Arizona told about how he had gone to a lot of trouble to direction find and smoke out quite a bunch of illegal CBers (are there any legal ones left?) and turned their names, addresses, psuedonyms and car license plate numbers over to the FCC. He suggested that other concerned amateurs do likewise.

From New Mexico another reader wrote to tell us that the amateurs there had also become concerned with interference to radio communications on the sheriff's frequencies. This consisted of jamming, profane language and attempts to misguide or confuse officers. When it was proposed to the FCC inspector, he told them they were spinning their wheels, and even if

(Continued on page 12)



IN–ARC

The LaPorte IN, Amateur Radio Club will hold its annual Swapfest-Auction on February 10, 1974, inside the LaPorte Civic Auditorium, beginning at 10AM; auction beginning at 1 PM. Talk-in will be on .94 Simplex and 22/82. For further information contact: Alan Rutz WA9GKA, R.R.2, P. O. Box 410, LaPorte IN 46350.

INTERCITY AUCTION

The Intercity Radio Club annual auction will be held Friday February 1, at the Naval Reserve Training Center on Ashland Road. Doors open at 6 PM. Look, swap, buy at 7:30 PM. No flea fees or commission charged. Auction at 8 PM Eats. Donation of $1 at the door. For more information write K8JPF, 120 Homewood, Mansfield OH 44906.

CUYAHOGA FALLS AUCTION

The Cuyahoga Falls Radio Club proudly announces the annual Cuyahoga Falls Radio Club Auction to be held Friday, February 22, at the United Electronics Institutde Building, 1225 Oplen Ave., Cuyahoga Falls OH. Hours are 7 PM to 11 PM. Flyers bearing more details are available from Tom Carroll WA8ZGL, Cuyahoga Falls RAdio Club, P. O. Box 106, Cuyahoga FAlls OH 44222.

TOLEDO AUCTION

On Saturday, March 9, 1974, the Toledo Mobile Radio Association will hold its 19th annual amateur radio auction at the Lucas County Recreation Center in Maumee OH. For more information contact: Barry C. Leeper, 1811 Wellsley Dr., Toledo OH 43606.

FOREST VIEW FEST

The Forest View ARC Hamfest will be held on Sunday, February 3, at Forest View High School, 2121 Goebert Road, Arlington Heights, Des Plaines IL, from 8 AM to 5 PM. Features include free parking, all indoor facilities, food and refreshment stand, manufacturer's display and a brand new Drake TR-22 for a door prize. Bring gear to swap, sell or auction. Talk-in on .94. Advance registration S1.50 or $2.00 at the door. For advance reservations or more information write to Tony Mazzeffi WB9GEC, 490 Easy St., Des Plaines IL 60016.

WHEATON SWAP & SHOP

The Wheaton Community Radio Amateurs (WCRA) will hold their 12th Annual Midwinter Swap and Shop on Sunday, February 10, at the DuPage County Fairgrounds Wheaton IL. Hours are 8 AM to 5 PM. Tickets $1 50 advance; $2.00 at the door. Two buildings again this year and unlimited parking. Bring your own tables. Free coffee and donuts 9:00 – 9:30 AM. For more information and advance tickets contact: L. O. Shaw W9OKE, 433 S. Villa Ave., Villa Park IL 60181. Advance ticket orders must be postmarked no later than February 3, 1974.

SOUTHERN TIER FEST

The 15th Annual Hamfest sponsored by the Southern Tier Amateur Radio Club, is scheduled for 2:00 PM, March 30, 1974, at St. John's Ukranian Hall, Johnson City NY. Admission to lectures and flea market is free; awards and excellent dinner, S6.00. For tickets or further information write to STARC, P.O. Box 11, Endicott NY 13760. Advance ticket sales only by March 27, 1974.

PLAYGROUND SWAPFEST

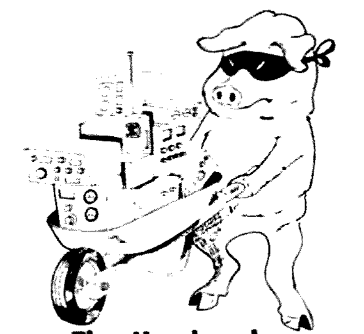
The Playground Amateur Radio Club of Fort Walton Beach FL, announces the Fourth Annual North Florida Swapfest to be held on March 31, 1974, from 3 AM to 5 PM at the Community Center located on U.S. Highway 98 in the downtown Beach area. Tickets and details are available from the P.A.R.C., P. O. Box 873, Fort Walton Beach FL 32548.

WOODWARD SWAPFEST

The Great Plains Amateur Radio Club of Woodward OK, is happy to announce its second annual Woodward Hamfest-Swapfest will be held on March 30-31, 1974. The event will be held at the Woodward County Fairbuilding in Woodward. For more information contact: Tyler L. Todd WA5YQP, Hamfest Promotion Chairman, P. O. Box 893, Woodward OK 73801.

MIDWINTER SWAP

The Tri-County ARC Midwinter Swapfest is March 10, 9 AM to 5 PM, at the National Guard Armory, Whitewater WI. $1 advance, $1.50 at the door (additional $1 reserves one display table). Advance tickets eligible for special prize. Talk-in on .94. Refreshments, free parking, everything indoors. For tickets and details contact: Dan Servais WA9AJW, Rt. 4, P.O. Box 309AA, Elkhorn WI 53121. Tel. 414-723-2227, SASE.

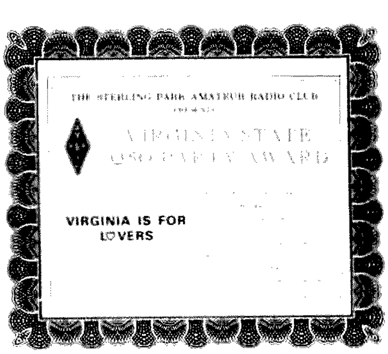


The Hamburglar STRIKES AGAIN!

List from Past Issues:

Mfr., Model, Ser. No.	Owner	Issue
AF68 No. 10888	K5LKL	1/73
PMR8 No. 10918		
M1070 pwr supply		
Trio TR2200 No. 241969	WA2ZBV	1/73
Clegg 22er No. 1900-578	WIDHP	2/73
Standard 826M,No. 112007	WA8PCG	3/73
FM27B No. 27013-1141	W2LNI	4/73
FM-144-10L No. F459	WA6WOA	4/73
NPC 107m pwr supply		
2, 5AJ-IPL Onan Gen., No. 327885		
R4B No. 11578G	WA8GVK	6/73
T4XB No. 17801 G		
W4 wattmeter No. 8390		
Swan 250 No. F154806		
Swan ac pwr. sup. No. 0653556		
HR-2 No. 04-C2879	W6GSR	6/73
SB-34 No. 211828		
STD 826 No. 011268	WA2FSD	6/73
HT220 No. GJ7327	State Univ. of NY (Albany)	6/73
Yaesu FT-101 No. 82G12279/CW	W4GF	7/73
HR-2 No. 0302030		
Clegg 27B No. 72013-1068	W3BXL	7/73
Std. 826MA No. 208078	WB2DEW	7/73
Drake ML-2 No. 10582	W3MSN	8/73
Tektronics 453 Scope	WB2FZU	8/73
Sonar FR-2528 No. 21-4250	Doherty	12/73
Std. src-851-SH No. 9725		
Std. src-707C No. 2833		
TPL PA-6-IDE No. 1092		
RP MEA-22 No. 212		
Two Larsen antennas		
Swan 270 No. M-252616	W4NTB	12/73
Std. src-146A No. 208070	W7DKB	12/73
Marker Luxury No. 2296	W7BVP/6	2/74

VIRGINIA QSO PARTY



The Virginia QSO Party, sponsored by the Sterling Park Amateur Radio Club, will be held from 1800 GMT March 9, to 0200 GMT March 11, 1974. For further information contact: Don Wiles W4IML, 9801 Lomond Dr., Manassas, Virginia 22110.

AMSAT NEWS

Mike Frye WB8LBP
640 Dauville Dr.
Dayton OH 45429

ORBITAL INFORMATION

Orbit	Date (Feb.)	Time (GMT)	Longitude of Eq. Crossing °W
5927	1	0002.4	48.3
5940	2	0057.3	62.0
5953	3	0152.2	75.8
5965	4	0052.2	75.8
5978	5	0147.1	74.5
5990	6	0047.0	59.5
6003	7	0142.0	73.2
6015	8	0041.9	58.2
6028	9	0136.8	71.9
6040	10	0036.8	56.9
6053	11	0131.7	70.6
6065	12	0031.6	55.6
6078	13	0126.6	69.3
6090	14	0026.5	54.3
6103	15	0121.4	68.1
6115	16	0021.4	53.0
6128	17	0116.3	66.8
6140	18	0016.2	51.8
6153	19	0111.2	65.5
6165	20	0011.1	50.5
6178	21	0106.0	64.2
6190	22	0006.0	64.2
6203	23	0100.9	62.9
6215	24	0000.8	47.9
6228	25	0055.7	61.6
6241	26	0150.7	75.4
6253	27	0050.6	60.4
6266	28	0145.5	74.1

AMSAT Expands OSCAR 6 Operating Schedule

AMSAT has announced a change in OSCAR 6's operating schedule, effective December 1 the new schedule is:

Thursdays, Saturdays, Mondays (GMT days) — Satellite repeater ON for communications during south-to-north passes only (same as present). These ascending node passes occur in the late afternoon and evenings.

Tuesdays, Fridays, Sundays (GMT days) — Beginning Dec. 2, the repeater will be ON during north-to-south (local morning) passes, primarily for use in educational demonstrations.

Telemetry data will continue to be taken on the reference orbits, i.e., about 5—15 minutes after the first equatorial crossing of each Greenwich day.

AMSAT is expecting greatly increasing temperatures during the next four months, and this new operating schedule is intended to prevent the battery from overcharging and overheating during this critical period.

This month I am including a summary of the AMSAT-OSCAR 6 Users List, as a commemorative to the 1816 amateurs in 74 countries who made successful QSO's through OSCAR 6 during the first year of its operation. This list indicates the high interest and dedication of amateurs throughout the world who have worked long and hard in achieving their goal.

Total USA: 737 (40%)
Total Outside USA: 1079 (60%)
Total Countries: 74
Total Stations: 1816 – 1025 confirmed

Ranking of AMSAT-OSCAR 6 Users by Country on a Per-Amateur Capita Basis (As of Oct. 15, 1973).

Rank	Country	Total Amateurs	OSCAR 6 Users	Percentage of hams using OSCAR 6
1	New Zealand	4,641	70	1.5%
2	Australia	6,461	85	1.3%
3	Finland	2,000	23	1.15%
4	France	7,500	81	1.1%
5	Sweden	4,400	44	1.0%
6	Czechoslovakia	2,070	20	0.97%
7	W. Germany	20,380	168	0.82%
8	England	16,837	113	0.67%
9	Japan	14,576	90	0.61%
10	Canada	12,892	57	0.44%
11	Italy	6,000	24	0.4%
12	USA	282,850	737	0.26%
13	USSR	15,085	30	0.20%
14	Argentina	17,500	22	0.13%

Total: 1564
(86% of all OSCAR users)

. . .WB8LBP

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you are interested, send *73* your name, address and phone number. Don't be bashful — remember, it's always easier when you have someone to give you that added bit of confidence.

73 would appreciate amateurs and clubs looking this list over and helping whoever they can. Do you remember when you needed help?

Ardeth Lawson
1317 Scoville Ave.,
Pomona, California
91767

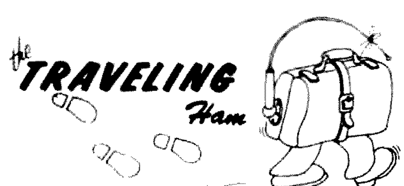
Davy Rinker
10961 S.W. 121st St.
Miami FL 33156
251-6503

Allen Reed
808 Oliver St.
Gastonia NC 18052
867-6532

Eric Williams
410 Woodland Dr.
Santa Cruz CA 95066
408-353-3142

Thomas G. Valosin
RD I, Warrior Way
Middleburgh NY 12122
518-827-4800

Rodney Patches
R.O. I, Box 78
Lebanon PA 17042
717-949-6552



Joe Kasser
1701 East-West Highway, Apt. 205
Silver Spring MD 20910

This month we shall take a look at 2m FM activity along a narrow strip of road between Washington and Cleveland OH. Leaving Washington and driving up I-70s the 31/91 and 28/88 Washington area repeaters are easily workable. A few miles up the road the 13/73 machine on a mountain in Frederick MD is available. It has an extremely wide range. The next repeater is the 34/94 machine in Hagerstown. Now up to

the Pennsylvania Turnpike and along it to Pittsburgh. Stay on 94 or 52. Although snatches of activity can be heard on 76, there does not appear to be anything within range. There is activity on 94 both from passersby and from the locals. Also you never know, you may be warned of backups well ahead of time and be able to get off the restricted access highway in time.

Pittsburgh has repeaters on 19/79, 28/88 and 37/97. The majority of the users on the 37/97 machine are the KDKA gang. And a friendly crowd they were when I worked them as I passed through the area last Thanksgiving weekend. The city repeaters are a bit spotty along the turnpike, but can be readily worked for quite some distance.

A little further along the 25/85 repeater at Beaver Valley comes into range. It has its best coverage between exits 3 and 4 in the big city area and is located near exit 2. Crossing the border into Ohio the 31/91 Youngstown machine is heard at good strength as it is a new one on 37/97. When I passed through they were testing it, running about 3 watts at a low site (one of the QTH's of one of the group's members). It was workable for a good 30 miles. Just wait until they get that thing up in the air!

Cleveland has three repeaters. The 16/76 machine is PL or tone controlled to avoid QRM from Detroit MI. The 28/88 and 34/94 repeaters are open to anyone.

2m FM seems to be great for driving vacations or trips of any kind. Most operators are very friendly to strangers and willing to pass *out* helpful and useful information to travelers. Some will even call up your friends or relatives on the landline and inform them that you have arrived in town and that you can be expected shortly. They will even dial up the autopatch for you if the repeater is so equipped.

However, driving through the rush hour to work in your home town and listening to the repeater is another story. In many places it is impossible to get a word in edgeways. What's the matter, more repeaters? At one time one Detroit group figured out that the number of users on their repeater was such that everyone was entitled to ten minutes a day and anyone exceeding his allotment was gently reminded of that fact by the other users. After a while the repeater began to remain idle with everybody listening rather than transmitting and QSO's between two stations were kept short. Perhaps that sort of time division usage may come into vogue.

What is the coverage of your local repeater like? I'd very much like to hear from *you* so that I can pass on the information to any prospective visitors to your area. After all spring is on its way, and in spring a young man's fancy is supposed to turn to . . .

G3ZCZ

LEAKY LINES

David Mann K2AGZ
Daniel Lane
Kinnelon NH 07405

It need not even be stated, but almost every single amateur is aghast at the prospect of the unwarranted proposal to grant a significant portion of one of our VHF bands to a group of idlers and dilletantes who have demonstrated little or no qualification for its stewardship. This group, (with some exceptions, of course, but not many), has demonstrated over and over again that it is unfit to be entrusted with so precious a resource. Their record of lawlessness and irresponsibility is a glaring matter of public knowledge. It is perhaps regrettable that the few responsible and conscientious individuals among them must bear the onus and stigma brought about by the iniquities and misdeeds of the many. But the plain truth is that the 11 meter band which they have been occupying for some fifteen years, and which was taken away from amateurs in a similar way (and for similar reasons as those now cited), is as rife with lawlessness as a dark street in any crime-infested city slum.

The violators far outnumber the law-abiding users, at least so far as their noticeable presence on the air is concerned, and there is little reason to suppose that a mere transposition to another band would cause any significant change, either in attitude of contempt toward regulations, or in excessively poor operating practices.

The sole worthwhile accomplishment of this change would be the elimination of the skip condition which contributes greatly to the most persistent violation category. But this would cut off only one opportunity to flout the regulations which govern the Citizens Band. There would still remain many areas open for continued infractions, and there is virtually no justification to imagine that they would stop their misbehavior. There would still be antenna-height infractions, use of unauthorized VFOs (should crystal control operation be continued), illegal use of linear amplifiers in open defiance of power limitations, outrageous disregard of identification requirements and procedures, total flouting of prescribed standards of decency in content and context of communications, and many other perfectly obvious violations which are now so widespread in CB operations. Any idea that these evils would automatically vanish with this frequency change, would be unrealistic indeed.

The most glaring problem lies in the apparent inability of the FCC to police the presently allocated Citizens Band, due to a lack of funding and a shortage of adequate manpower to do the job. Unquestionably, there is good reason to think that there is as much (or more) dire need of stiff enforcement on this band than on almost any other slice of FCC administered spectrum space. In fact, the problem of repeater violations on CB has become exacerbated in direct proportion to the CBer's growing awareness that the Commission is either unable or unwilling to deal with them as severely as the regulations call for. What, we'd like to know, makes the FCC think that when this bedlam shifts over to 220, it's going to get better?

How, just for a f'rinstance, could the Commission employ sanctions or penalties against those numberless stations which are being operated without any licenses at all? There have been various estimates concerning this, and apparently it runs into astronomical proportions. CB licenses cost a great deal of money, and if they can operate clandestinely, why should the Commission expect them to comply with the law? This is especially true in cases where illicit use is the rule. . .people using identifying names like Pussy cat, the Swamp Rat, the Rambling Redskin, Alligator Pete, and Sam the Man? They may be forced to stop their DXing due to the forced change to a ground wave band, but they will find some other way to operate illegally, for that is apparently the way they get their "jollies." The move to 220 will not foster any appreciable improvement.

If an amateur operator, through repeated violations, is deemed by the FCC to be an incorrigible case, he is summarily deprived of his ticket, perhaps fined, and may even face imprisonment. There is a record on file of his identity and his whereabouts. Also, he is required to know and understand the regulations, for there is a body of questions relating to this subject matter in the exam which he is required to pass in order to obtain his

(Continued on page 97)

SSTV SCENE

Dave Ingram K4TWJ
Rte. 11, Box 499, Eastwood Vil. 50N
Birmingham AL 35210

One of the biggest innovations in SSTV, the Direct Slow to Fast Scan Digital converter, is slowly but surely approaching reality and 1974 may be the year for it. Although this is a many year project, it is growing in a number of steps, which has accelerated its development, and there is a possibility that a prototype may be displayed at Dayton this April.

Basically the conversion process consists of reading a digitalized copy of the complete Slow Scan TV video frame into computer memory ICs, and then playing back the picture at a high speed into a regular TV receiver. Memory capacity requirements for this unit are large, (between 100,000 and 200,000 bits) and previous memory cost of 1 or 2 cents per bit have made this unit too expensive for the average ham ($2000). Recently, however, these chips have begun to show up on the surplus market as "seconds" at approximately 5/100 cents per bit, thus lowering memory cost to between $35 and $50. Adding to this the support ICs and additional parts gives an approximate overall cost of $200. The scan converter will work something like this: The first 8 second SSTV picture will load the memory unit, then during the second 8 second period this will read out at Fast Scan rates into a regular big, bright TV. A frame hold switch can be used for continually reading a picture out of the memory while the transmitting station describes that particular picture. Succeeding phases of the scan converter will include image enhancement (averaging out the noise component by integrating the incoming video with the video already received and stored), color SSTV (color frames loaded sequentially into memory, then played back all at once into the home color TV set) plus some other "stunts." Those present working on the converter include WØLMB, W9NTP and W6MXV. Our thanks to WØLMD for the previous information.

The 'joint" Worldwide Slow Scan contest is coming up on the 9th and 10th of this month (see following rules for specific details) and activity promises to be good. The contest is scheduled a little earlier this year to avoid conflict with other major contests. Further, the U.S. is exempt from video only contacts, *however* a Slow Scan picture containing the call sign, report and QSO number must be exchanged. Audio only contacts do not count. Since these rules were published, it has come to our attention that a *few* other countries also require identification of SSTV transmission on audio (Australia is a good example). Although I have not yet cleared this with Professor Fanti, I'm sure those countries will also be exempt from the SSTV only clause. (Obviously we don't want anyone getting citations!) Remember I will be tallying U.S. logs and sending the scores on to Franco, so that we (73 Magazine) can issue certificates to the top U.S.A. contenders. My deadline is March 10, so I will have time to mail the results on to Franco, whose deadline is the 20th. I wish you all the best of luck in the contest, and would like to hear your comments and opinions when you send in your logs, along with any pictures you might lend for use in this column. Watch for these "results and comments" in a few months!

Another weather satellite was placed into sun synchronous orbit during November, and was due to begin operation by mid-January. The satellite is termed NOAA-3 and is capable of Automatic Picture Transmission, thus hopefully replacing the dying NOAA-2 satellite. I understand it will use the same frequencies as NOAA-2. More information on this as it becomes available.

RULES

The Italian Magazine CQ Elettronica and 73 Magazine takes pleasure in announcing the 4th Worldwide Slow Scan Television Contest. The purpose of this Contest is to promote increased interest in the SSTV mode of operation as used by Radio Amateurs.

1) PERIOD OF CONTEST

Part 1: 1500-2200 GMT on February 9th, 1974.

Part 2: 0700-1400 GMT on February 10th, 1974.

2) BANDS

All authorised frequencies within the 3.5-7.0-14.0-21.0 and 28.0 MHz bands.

3) MESSAGES

Messages will consist of: Exchange of pictures and also included are a) the call sign: b) report (RST): 3) serial number.

The serial number must start at 001 and is increased by one for each successive contact during the period of the Contest and the serial number is irrespective of the Band(s) used.

Exchange must be made exclusively with the SSTV mode. For the "W" are accepted the FCC Rules.

4) EXCHANGE POINTS AND MULTIPLIER

a) Contact score 1 point per contact on the 3.5, 7.0, 14.0, 28.0 MHz Bands. 2 points per contact on the 28.0 MHz Band, can be utilized on each Band. In addition to the ARRL Countries the W call areas WØ to W9 and VE Call areas from VO to VE7.

The same Continents and Country are only valid once on each Band. The same station can only be worked once on each band (Max 5 contacts) during Contest period.

5) SCORING

Total exchange points multiplied by the multiplier total.

6) SECTIONS

a) Entrants transmitting and receiving video.

b) Entrants receiving video only. For this purpose the same general rules apply and the same stations heard is valid once only on each Band.

A separate results table will be made for each of these two classes of entry.

7) LOGS

Logs should contain: Date, Time of contact (GMT), Band in use, Call sign, Report (RST) sent and received. Serial numbers sent and received, points, multipliers and final score.

Although not essential, it would be appreciated if entrants could enclose a cover sheet with a short description of the Station (With photo if possible) together with any comments on the Contest.

All entrants are kindly requested to report on any serious Contest irregularities, e.g. Exchanges in other modes.

For entrants in the b. Classification it is only necessary to record the message of the station heard.

Send U.S. logs to:

Dave Ingram K4TWJ

8) RULES OF BEHAVIOR AND PENALISATION

The Logs must be compiled in accordance with the Rules listed in section 7. The contacts must be made by means of the SSTV mode and it is not permitted to use another mode of transmission either before, during or after the exchange of the message by Slow Scan Television.

During the Contest it is expected that Amateurs will observe the fundamental rules of courtesy and good operating during contacts.

Failure to observe any of the above Rules will result in the exclusion of the entry from the final results and any such Logs received will be considered as check Logs.

All Logs received become the property of the Edition CD and will not be returned.

The decision of the organising Committee in any dispute will be final and any subsequent controversy cannot be referred to the Civil Court.

K4TWJ

50 MHz BAND

Bill Turner WA0ABI
Five Chestnut Court
St. Peters MO 63376

WA1EXN worked a short aurora the 12th of November, only 3's were active during the 30 minute opening. Art is looking for scatter contacts – he remarks of having worked K8LEE and WB4YAB but "Where have all the scatter stations gone? Hear K8MMM occasionally on Sunday. K88BN is conspicuous by his absence."

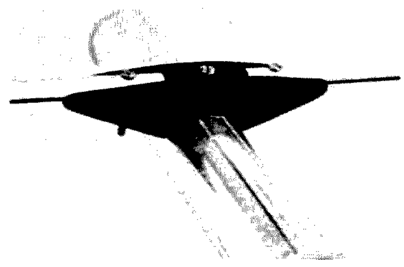
Paul K1TOL was active from Lewiston, Maine during December before returning to UCLA to finish up his masters degree. His father (K1GPJ) will be operating the SB-110A and modified SB-200 for a while (heard Paul working WB4VLH around 0345Z the 12th).

Late November and early December brought several openings to the Missouri area. November 26th heard and/or worked W1GAO, W5TDZ, WB2PSV, K2LCK, K1ZFE and WA1ILN. The last two were making the most of new SBE SB-50's. The 27th worked WA4GM, the 29th WA1EXN, K2LCK again plus others. December 9th worked WA0VPY, Bruce in Sioux Falls, heard K2ZYX (working WA5RBI), WB2DNE, WA2SAZ and others.

WB2KLD writes that he is back on 6m following an absence of five years. Tom is running a Swan 250 with an FET preamp and five elements at 695' AMSL and monitors 50.110 daily from 0730–0830 and 2130–2300 local. Tom is looking for schedules, tropo or scatter. You may contact him at RD No.1 Warrior Way, Middleburgh NY 12122.

The Six Meter International Radio Klub, "SMIRK," has been established by W5QDB, K5ZMS, K5HVC, K5OOJ, WA5CBT and K5WIB in an effort to increase band activity. The group plans to issue a membership certificate and publish a newsletter. For details contact W5QDB.

Another club with similar aims is "SPECM," the Society for the Preservation and Encouragement of Six Meters. As the name implies, the object is to keep Six active and encourage more hams to try our first love. The club holds its meetings on 50.125 at 9 pm Central time Sunday evenings, in the event of a contest or band opening the frequency is shifted to 50.150. All stations, AM, SSB, and FM are welcome to check in. At present the membership includes hams in Illinois, Wisconsin, Michigan and Indiana. Those interested in membership (at $2.00) and receiving the club newsletter and certificate should contact the secretary, Raymond J. Schmidt WA9FXT, 1450 Windsor Circle, Carpentersville IL 60110



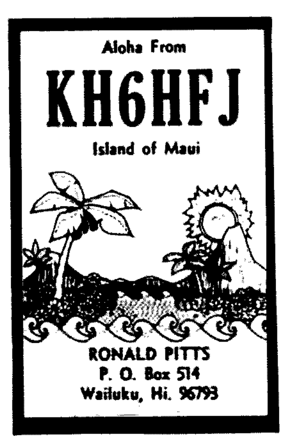
The boom to element clamp of the new KLM six meter antennas. The aluminum is all 6063-T832, the hardware stainless steel.

KLM Electronics, 1600 Decker Avenue, San Martin CA 95046 manufactures two versions of the Oliver Swan bandpass antenna design. Available in 8 and 11 element versions, these antennas are made of 6063-T832 aluminum with stainless steel hardware. The booms are 2" in diameter, the elements ½", The frequency range is 49.5 to 52.5 with a maximum VSWR of 1.15:1. The impedance in both cases is 50Ω balanced. Other specifications are as follows:

Gain over isotropic	8 ele.	11 ele.
Boom length	14.3	16.3
3 dB points	18'3"	30'
Weight	24°	21°
Price,	12 lbs	27 lbs
Fo.O.B. San Martin		
F.O.B. San Martin	$55.95	$89.95

WA0ABI

QSL CONTEST



Ronald Pitts KH6HFJ, wins the QSL Contest this month. Pictured on the right of his card is the Haleakala Crater. On the left are the West Maui Mountains, the Pacific Ocean and the Kealia Fish Pond where the Humunukuhapuhaha love to swim. You too can win a one year subscription to 73!

Send your QSL to: QSL Contest, 73 Magazine, Peterborough NH 03458.

CONTESTS

Tom DiBiase WB8KZD
708 6th Avenue
Steubenville OH 43952

Feb. 9–10	Ten-Ten International Net Contest
Feb. 23–25	Vermont QSO Party
Mar. 9–10	Worldwide VHF Activity
Apr. 12–15	Counter Hunters SSB Contest
Apr. 20–22	Zero District QSO Party

THIS MONTH
Ten-Ten
International Net Contest

Starts 0000Z Feb. 9, ends 2400Z Feb. 10. Exchange name, QTH, and 10X nr. Score 1 pt. for each member contacted, 1 extra pt. if DX member, Y1-XYL, or Chapter Head. Appropriate awards. Logs go to Grace Dunlap K5MRU, Contest Manager, Box 445, La Feria, Texas 78559, and must be received by Mar. 15, 1974. SASE for results.

Vermont QSO Party

From 2100Z Feb. 23 to 0100Z Feb. 25. Stations may be worked once per band/mode. Frequencies are 3685, 3909, 3932, 7060, 7290, 14060, 14290, 14325, 21060, 21375, 28100, 28600, 50260, 50360, 144–144.5, 145.8. Out-of-state stations score 3 pts. per VT QSO and multiply by total Vt. counties worked on each band. Vermont stations score 1 pt. per QSO and multiply by total ARRL sections and countries worked. Exchange QSO nr., RS/T and ARRL section (County for Vermont). Send logs with SASE before Mar. 31 to Peter Kragh, W1AYK, 170 Summit Ave., Ramsey NJ 07446.

...WB8KZD

Caveat Emptor?

Price – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

FREE: 18 crystals of your choice with the purchase of a new Genave GTX-200 at $259.95. Send cashier's check or money order for same-day shipment. For equally good deals on Drake, Swan, Standard, Clegg, Regency, Hallicrafters, Tempo, Kenwood, Midland, Ten-Tec, Galaxy, Hy-Gain, CushCraft, Mosley, Sony, and Hustler, write to Hoosier Electronics, your ham headquarters in the heart of the Midwest. Become one of our many happy and satisfied customers. Write or call today for our low quote and try our individual, personal service. Hoosier Electronics, R.R. #25, Box 403, Terre Haute, Indiana 47802. 813-894-2397

WE BUY late model Collins-Drake-Swan. Top prices, cash. Associated RAdio, 8012 Conser, Overland Park, Kansas 66204. Call: 913-381-5901.

KLM AND MADISON ELECTRONICS present the finest in VHF antennas. 144-148 MHz, 7 elements to 16 elements; 9 elements $31.95; 14 elements $45.95; 16 elements $49.94; 420-450 MHz, 14 elements, $19.95; 27 elements $41.95. Write for literature. Shipping charges collect either factory shipment or Houston stock. Madison Electronics, 1508 McKinney, Houston TX 77002. 713-224-2668, Nite/Weekend 713-497-5683

DAYTON HAMVENTION expands to three days April 26, 27, 28, 1974 at HARA ARENA and Exhibition Center. Brochures mailed March 15th. Write for information if you have not attended the last two years. P.O. Box 44, Dayton, Ohio 45401.

MITE UGC-41 TTY with spare case and PC cards; 3 speed gears, brand new condition; ST-6 converter built from HAL kit, wide and narrowshift, autostart; all manuals; $450 for package; you pay shipping. W1BRJ, 7 Pickwick, Marblehead MA 01945. 617-631-1308.

EQUIPMENT FROM 73

The following list of gear, unless otherwise noted, consists of brand new equipment purchased for testing purposes only. Some have been tested, some remain unopened in original cartons. We are offering this gear at a considerable discount on a first-come-first-served basis. Please send Money Orders or Certified Checks only to 73 Magazine, Peterborough NH 03458.

Cap Com 40M solid state SSB xcvr	$150.00
Gladding 12V power supply	$60.00
SBE Scanavision	$650.00
Midland 13509 220 xcvr	$200.00
Tempo CL-220 220 xcvr	$200.00
Clegg FM-21 220 scvr	$255.00
TME-H-LMU 16 channel rcvr	$255.00
Digital logic-clocks	$80.00
Wilson 7 element 10 and 15M beam pick up only	$250.00
Waller 60A power supply	$105.00
Pickering KB-1 keyobard	$200.00
Heath HWA-202-1	$30.00
Heath HA-2022 amplifier	$70.00
Gladding HI Scan	$150.00
Regency TMR-8-U Scanner	$140.00
Tempo fmh charger	$25.00
GTX-2 FM rcvr	$225.00
Newsome 2M KW amplifier	$350.00
Heath IC-2009 calculator	$90.00
SBE 450 FM xcvr	$340.00
Mits 908M w/ac and case	$130.00
Memory Matic 8000	$320.00
IC-30	$450.00
IC-60	$400.00
RP Synthesizer MFA 22	$225.00
AX 190 amateur xcvr	$200.00
Pickering KB-1 keyboard	$200.00
FPM 300 SSB rcvr	$480.00
SBE-450 FM xcvr	$340.00
GYX-200 (slightly modified)	$200.00
Heath 1B-101 counter with Vanguard scaler	$250.00
Standard SRC-120/5 power supply	$44.00

CALCULATOR OWNERS: Use your +-x÷ calculator to compute square roots, cube roots, sin(x), cos(x), tan(x), arcsin(x), arccos(x), arctan(x), logarithms, exponentials and more! Quickly, accurately, easily! Send today for the IMPROVED AND EXPANDED EDITION of the First and Best Calculator Manual – now in use throughout the world. . .only $2.00. Unconditional moneyback guarantee – and FAST service! Mallmann Optics and Electronics, Dept. -E2, 836 South 113, West Allis WI 53214.

"I LOVE THE BANJO" my latest Stereo LP 36 tunes Dixie to Classic banjo solo $4.95 PP. Richelieu, The Banjo Man, W9JS, 215 S. Washington, Wheaton, Ill. 60187.

GENERAL ELECTRIC TPL, 80 watt 2m with PL, $175. RCA Supercarfone 450 MHz, $195. Both are solid-state except for finals and are in excellent condition. Robert Bliss, Jr., 1440 Lakeview Ave., Minneapolis MN 55416.

HALLICRAFTER HT32A, mint with manual, W1JSS. 617-762-5252.

TEKTRONIX OSCILLOSCOPE-531A Rack Mount with CA dual trace plug-in, 15 MHz Bandwidth. Both mint condition, $475. J. R. McNeil, 617A Groton CT, Dayton OH 45431.

GLADDING 25 with GE preamp, all crystals and pad, 25 watt 2m FM transceiver, $150. Bill Montag, P. O. Box 788, Cologne NJ 08213. 609-296-44711

SELL: Heath SB-310 receiver with best CW and SSB filters and with SBA-310-3 13 & 15m modification kit, all for $200. . .Heath DX-60B transmitter with extra final, for $50. Bill Morse, 901 N. Halifax Apt. B., Daytona Beach FL 32018. 904-253-8859

GREATEST of them all! That's the ARRL 1974 National Convention, sponsored by Hudson Amateur Radio Council. Remember the dates – July 19, 20, 21 at the Waldorf-Astoria, New York City. Three days of exciting events!! Wide array of demonstrations, exhibits and forums featuring latest in FM, SSTV, ATV, RTTY, FAX, Satellites, Antenna design, Transistors, Integrated Circuits, DX, MARS, ARPSC and much more. Something to do every exciting minute for YLs & XYLs – Tours, New York sightseeing, visits to popular TV shows, Parties, Fashion Shows. Meet the ARRL President, Vice-presidents, and all 16 Directors! Famous-name Speakers at Saturday Night Banquet! Everything for the Non-Ham, New Ham and Old Timer. For Info, Contact: ARRL Convention, 303 Tenafly Road, Englewood, N.J. 07631.

ANTIQUE RADIO BUFFS. Do you need a schematic for your radio? For information send S.A.S.E. showing make and model number. Joseph C. Crockett K3KUL, 762 S. Gulph Road, King of Prussia PA 19406.

FOR SALE: Drake T4XB R4B, AC-4, MS-4. Excellent condition with all cables and manuals, $750, shipped postpaid. Jim Gysan W1VYB, 617-922-3850.

PRINTED CIRCUIT TECHNIQUES FOR THE HOBBYIST. Ferric chloride "suspension Etching," cutting epoxy glass, screen printing, etc., BOOKLET $2.00. Trumbull, 833 Balra Dr., El Cerrito CA 94530.

VERY INTERESTING! Next 5 isues $1. "The Ham Trader", Sycamore, IL 60178. (Ask about our "HAM EQUIPMENT BUYERS GUIDE" covering Receivers, Transmitters, Transceivers, Amplifiers 1945–74. Indispensable!)

GALAXY R-530 receiver, Mint. Tunes 500 kHz through 50 MHz continuously. AM, CW, RTTY, SSB. Has .5, 2.1 and 6 kHz filters. Noise blanker. Picture in most current ham magazines. $495 firm you ship. Bryan Davidson, P.O. Box 119, Salem, Illinois 62881. 618-548-21888

R–290 WITH MANUAL $450. Eico 753 with ac supply $125. BRPEB-6 eight level teletype punch $80. HT-32 with manual $100. W1GBO, North Falmouth MA 02556.

FAX PAPER: For Desk-Fax, new (not surplus), precut (not rolls), $15 per thousand sheets, postpaid worldwide. Bill Johnston, 1808 Pomona, Las Cruces, New Mexico 88001.

MOTOROLA PORTABLES – Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal Services, 6663 Industrial Loop, Greendale WI 53129.

2m AMPLIFIER, 1 watt in – 25 watts out, $40; 10 watts in – 45 watts out, $35. SASE for details. Griff K4IAE, 203A Branson St., Chapel Hill, North Carolina 27514.

GOOD NEWS – The SRRC Hamfest June 2, 1974 at fabulous new site in Princeton, Illinois Fairgrounds. SRRC/W9MKS, RFD No.1, Box 171, Oglesby, Illinois 61348.

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding. Literature. Estes Engineering, 543-A West 184th St., Gardena CA 90248.

ACTIVE HAMS – monthly mailer of reconditioned and new equipment specials. Sell -- Buy -- Trade. Write: Associated Radio, 8012 Conser, Overland Park, Kansas 66204.

CLEGG 22er FM with repeater crystals $295. Clegg 22er AM $297. More goodies. Send address to: Dale Hutchinson WA9KQD, 824 Read STreet, Lockport IL 60441.
Street, Lockport IL 60441.

COLLINS FOR SALE: Complete S-Line purchased new in December 1972. Very very mint conditions: 75S-3C, 32S-3A, 516F-2, 312B-4, 30L-1, SM-3 mic. Receiver includes 200 Hz filter and MARS crystals – cost today over $4000. Will sell complete package for $2,950. R. O. Lions K6ZWG/7, 326 Morris Avenue So., Rentan WA 98055.

BUY-SELL-TRADE. Write for monthly mailer. Give name, address, call letters. Complete stock of major brands, new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc., SSB & FM. Associated Radio, 8012 Conser, Overland Park, Kansas 66204. 913-381-5901

TECH MANUALS for Government surplus gear, $6.50 each: R-220/URR, R-274/FRR, R-390/URR, URM-25D, URM-32, TT-63A/FGC, TS-382D/U, USM-16, BC-779B, TS-497B/URR. W3IHD, 7218 Roanne Drive, Washington, DC 20021.

(Continued from page 3)

he, as an FCC inspector, should walk in and find the violator in the act, the FCC would be powerless to do anything. He said that the only way the interference could be stopped would be for the state legislature to pass a law prohibiting such operation and then have the local officers clean it up.

The visit of another FCC inspector to a local broadcast station to give them a citation for having a power meter 10% out of tolerance (reading high!) provided an opportunity to discuss this jamming business at greater length.

The answer given was that the FCC has a signed contract with licensed stations and they intend to enforce it, but do not have a contract with unlicensed people. This might explain the lack of aggressiveness with CB bootleggers.

Alas, for the days of yore, when amateurs looked up to the FCC as sitting on the right hand of God They seem to have changed their location.

ANOTHER COLUMN?

Is there anyone out there who keeps up on the latest solid state developments? The new gadgets are coming along so fast these days that it isn't possible to keep up with them via articles. Perhaps a short monthly column in the newspages would bridge the gap.

If there are any engineers out there who would like considerable fame, some money and lots of free samples, then let us hear from you. It is beneficial if you already know how to write.

MOBILE DXing

As if it isn't difficult enough to rack up the countries, there are a few masochists who are managing the feat while operating mobile – on the order of rowing the Channel with one arm tied behind your back.

The hands down leader of the super-mobiles is Glen Tillack W6KZL/M6, who now has 253 countries confirmed! Glen claims that these are all honest contacts, made while he was in the car and using the car antenna, not backed up to a 20 element beam on a 200 foot tower on a mountain overlooking the ocean. Glen is also extremely active on slow scan television with one of the world's better SSTV signals and no few countries racked up on that mode. He was one of the few to drop trying to work a JA while I was active on slow scan from Navassa last year, thus getting one more on the less wide-awake brethren.

The number two man world wide, in mobile DXing is Jacques Boisanfray F3DJ/M with 221 countries confirmed.

Our old friend Edgar Wagner G3BID/M is holding down third place with 205 confirmed. I wonder if he is still mobiling in his Bentley? Edgar would have a lot more if he didn't spend so much time tooling around in other countries – he must have operated from a couple dozen or more mobile so far. If you're into wines, you're good for an hour contact with Edgar.

Eric Stöss DL6UH/M has 189 confirmed, making him fourth. Fred Hock WA3HDU/M3 is fifth with 168 confirmed and Bob Kaplan WA4WTG/M4 is sixth with 150 confirmed.

There's only about fourteen members of the Mobile Century Club, so maybe you'd better think about giving that one a try? You can get info and awards from N.A.S. Fitch G3FPK, 40 Eskdale Gardens, Purley, Surrey, CR2 1EZ, England.

RUSSIAN BOOTLEGGERS

A stringer for the Los Angeles Times had an interesting story, sent in by WB6ZGF (and thanks, Dave) about the big rise in bootleg radio stations within the USSR these days. Apparently the restrictions are so severe on getting ham licenses that many youngsters who become interested in radio turn to building rigs that interfere with aircraft communications, railroad traffic information, and things like that. The largest number are set up as broadcast stations on the medium and short wave bands where they run disc jockey programs and talk shows.

The radio officials are about as effective as our FCC vs CB, which is about as ineffective as is possible. In one area 115 illegal broadcasts were heard in one evening. Some of the illegal stations have sizable audiences as a result of the boring programs of the government stations. There are no commercial broadcast stations in the USSR, of course.

The illegal operators complain that there is one and only one ham club for the country and that it is almost impossible to get a license if you are a teenager.

(Continued on page 98)

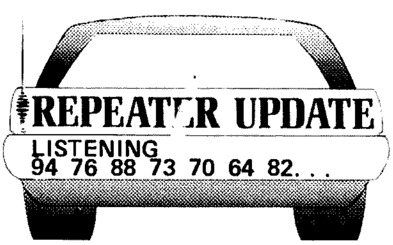
73 REPEATER ATLAS REGISTRATION

REPEATER CALL (WR only)	FORMER CALL	LOCATION (City)	STATE

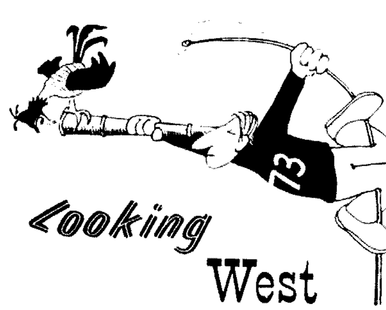
INPUTS	OUTPUTS	TT Wh TB PL	FM AM RTTY	AUTO PATCH	ERP	
		Hz				USEFUL RANGE (RADIUS)
		Hz				
		Hz				EQUIPMENT
		Hz				
		Hz				ANTENNAS & HEIGHT ☐ SPLIT SITE ☐ DIPLEXER

REPEATER GROUP/SPONSOR	TRUSTEE	ID—TYPE OR MFR.

☐ I certify that I have received no outside assistance while completing this form.		
DATE	SOURCE (NAME/CALL)	SPECIAL OR EMERGENCY FUNCTIONS



CT	WR1AAF	Oxford		147.49-146.49
IL	WR9AAF	Chicago		146.34-146.94
IN	WA9ZFM	Evansville	W	52.920-52.575
KS	WR8ABW	Merriam		448.1-449.1
MO	WR3ABQ	Baltimore		146.07-146.67
MI	WR8ABI	Oshtemo		146.19-146.79
NC	WA4NUO	Asheville		146.22-146.82
NC	WR4ABK	Charlotte		146.1b-146.76
NC	WR4ABT	Charlotte		146.22-146.82
NC	WB4QFT	Durham		146.22-146.82
NC	W4EHF	Fayetteville		146.31-146.91
NC	WR4ABL	Greensboro		146.16-146.76
NC	WR4ABP	Grifton		146.16-146.76
NC	WR4ABY	Hendersonville		146.04-146.64
NC	WR4ABX	Lexington		146.31-146.91
NC	WA4BVW	Mt. Pisgah		146.16-146.76
				222.34-223.94
NC	WR4ACF	Raleigh		146.04-146.64
NC	WR4ABF	Shelby		146.28-146.88
NC	WA4ZAT	Wilmington		146.22-146.82
NC	WR4ACA	Winston-Salem		146.04-146.64
PA	WR3ABZ	Center Point		147.66-147.06
PA	WR3ACH	Pittsburgh		146.22-146.82
PA	WR3ABY	Erie	W1477	146.22-146.82
PA	WR3ACA	Erie		146.34-146.94
				146.19-146.94
SC	WR4A8M	Lancaster		146.10-146.70
TX	WR5A8N	Midland		146.16-146.76
TX	WR5A8Z	San Antonio		147.30-147.18
TX	WR5ACF	Lufkin		146.34-146.93
VA	WB4QFS	Roanoke		146.38-146.98
VA	WR4A8U	Lexington		146.01-146.61
VA	WA4ZAU	Norfolk		146.19-146.79
WA	WR7ACF	Spokane		146.28-146.88
				449.85-444.85
WA	WR7ACE	Mt. Spokane		146.34-146.94
WI	WR9ABF	Milwaukee		147.99-147.39
				52.800-52.525
				449.50-444.50
				1250.0-1220.0
WV	WR8ACD	Charlestown		146.28-146.88



Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA

"Visiting a large overcrowded sardine can," I suppose that about sums up my personal feelings about going back to New York. Not that I dislike the place — far from it. It's just that in the past year and a half we have become so accustomed to the spread out design of Los Angeles that seeing the way we used to live just about gave me a case of claustrophobia. But, there were many good times in the two and a half weeks we spent back East, including being able to have an active part in getting the new Brooklyn Repeater (now located in Manhattan at the same site as WR2AA) on the air. As most of you already know, I was one of the people who put up the original Brooklyn machine about two years ago. Unfortunate circumstances led to its "leaving the air" in early 1973, and I made a pledge to myself to try my best to get both the machine and the Kings County Repeater Association going again. When we put up the original machine, it became more than just another repeater to us. Rather, it was assuming an important responsibility to those who had shown the KCRA support and had contributed their hard earned green stuff to make WA2ZWP a reality. Since many of these supporters were friends, I took this responsibility personally. Luckily there were others back in New York who felt the way I did and refused to let the project die. A new Kings County Repeater Association was formed, mostly out of the members of the old group and work was begun on getting both a new site and a new machine.

Under the guiding hand of Lou Belsky K2VMR, the new trustee, Phil

(Continued on page 16)

(Continued from page 14)

Knoll WB2VGK, and Abe Schwartz WB2PQR, a number of meetings open to all interested parties were held last spring and enough money was collected to purchase a duplexer, antenna and assorted accessories. In the interim I had written both Lou and Abe threatening to come to New York and put up the machine myself if no one else would do it. I didn't think they would take my threat literally, but in part they did. Abe and Stu WA2JNF had started building a solid state repeater from a Sonar hand held transceiver. Before they could finish the job, Abe had to take a personnel leave from the group. Though the unit would repeat, it had a tendency to desense itself and lacked other refinements. I was volunteered to do what I could to remedy the situation. When I left NY, all that was left to do was run the coax and connect the control lines. I had hoped to finish the entire job, but time and obligations would not permit it. It gave me a personal sense of satisfaction to know that I had been of some small amount of help to a real nice group of people; people I am proud to call friends.

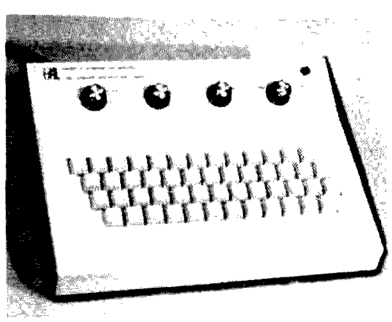
Help in the form of a repeater site came from other unexpected sources. After looking vainly for several months for a place to put the machine, another friend made his presence known. George Le Doux K1TKJ (who owns several repeaters in the Northeast including WR2AAA) offered to make space available for the KCRA machine at his location in lower Manhattan. In addition, he also offered to help with the necessary paperwork to get a license for the repeater. So, now there are two VHF repeaters operating about 20 feet from one another without any interference to each other. According to George the secret of this success is in the one meg split that both machines use. WR1AAA is on 73/73 and the KCRA uses 43/43. When the KCRA machine gets its license and goes into full time operation it will be open for all to use. I have been asked to invite visiting VHF FMers to use it. By the time you read this, they should be "on the air."

Back East, I got a chance to say hello to many old friends and make a couple of new ones. I operated a number of different machines including WR2AAA (ex WA2SUR), WR2ACD (ex WA2KEC) and the WA2UWC machine in New Jersey. On every machine I used, I found the atmosphere warm and the greetings friendly. I even got a chance to pull a "Wayne Green" and operate Subway Mobile using a Standard SRC146 while crossing the Manhattan Bridge on the BMT "N" train. You should have seen some of the startled looks from fellow passengers when my back pocket started to talk. "Rubber Duckie" antennas are a definite advantage if you ever decide to try your hand at this one.

Another high point of our trip was a visit to the town of Woodstock about 90 miles north of New York City. Sharon and I spent three delightful days with our non-ham friends Abby and Jim, just relaxing and taking in the scenery of this most picturesqute community. It is best known as an artist colony and home of the famous Woodstock Rock Festival a few years ago. Most important, though, it's the kind of place in which you can still do your own thing without having to explain to others why you are doing it. Where else can you s t for five hours over a couple of cups of coffee in a restaurant and just talk. They also have some of the finest galleries and craft shops to be found anywhere, and only about 1½ hours from the heart of Manhattan. If you ever get the chance, visit Woodstock. You won't be sorry.

. . .WA2HVK/6

NEW PRODUCTS



THE HAL MORSE KEYBOARD

Having tried out just about every code typing device to be put on the market, we couldn't pass up the chance to have a go at the HAL unit.

To save some suspense, it is superb. It is the easiest to use of any that we've tried, and by a wide margin over some of them. The keyboard works very smoothly and positively.

One other keyboard that we've used quite a bit recently was okay, but some keys had to be pushed hard, others lightly, and you had to remember which were which to prevent double letters being sent.

It doesn't take long to get used to using the keyboard. You do have to listen to what you are typing, for there is no memory in the unit and this means that you have to listen for each character to be started before you move your finger to another key. The variation in length of the characters means that you have to wait quite a while for the zero to be completed and the next character started, and you have to be nimble when sending an "e", for it is no sooner started than it has ended and, if you are not attentive, you're sending a string of e's.

The HAL unit was particularly handy for the making of the 73 Morse Code cassettes. We calibrated the code speed on the basis of the length of an "f", which seemed median and found that the keyboard would send from about 4.5 to 30 wpm. We could manage to type and keep up with it to around 15 wpm, but had some problems with perfect sending above that speed.

In order to not make any mistakes on the cassette code courses we did them at half tape speed (seven and 10.5 wpm) and then doubled the tape speed for making the cassettes.

One of the real pleasures of the HAL unit is the inclusion of eight special amateur keys to give such combinations as KN, SK, BT, CO, DX, AR, AS and DE. The DE key also is available with your call so that if you hold it down you get the works . . . DE W2NSD/1 . . . in our case. It certainly makes calling CO easy, as well as CQ DX.

The philosophical argument over whether it is better to send using a straight key or a keyer or a keyboard is one that can go on for ever. Each has its staunch adherents who are emotionally tied to their favorite. Some CW men feel that it is the ability to copy that is important, not how you send. For that matter, any way you do send will take skill and practice, and that includes the keyboards when you get up over 10 wpm.

The HAL keyboard has outputs for cathode keying a rig, for grid-block keying, and for tone output. It has a built in monitor speaker. The controls vary the speed, the weight, the tone and the volume. There is also a jack to plug in your hand key for times when you want to send manually.

The HAL MKB-1 is available for $175 in kit form and for $275 complete. If you're into CW, this is a way to have a lot of fun for a reasonable price.

NEW FILTER FOR HTs

Crystal filters have reached a new miniaturity in the Spectrum International XF-102. This complete crystal filter is built into an HC-18/U crystal can. It consists of a single 10.7 MHz crystal with two resonators plated on it, thus forming a two pole filter. The bandwidth is only 14 kHz, so with this filter added to your hand transceiver you can be sure of avoid-

ing spillover from the next channel, so often a misery with these small rigs.

Now how much do you think this remarkable filter costs? One would expect it to run around $20, but the fact is it sells for only $8.50 from *Spectrum International, Box 1084, Concord MA 01742.*

The insertion loss is only 1.5 dB, so you'll hardly know it is in the circuit. The shoulders are fairly steep on the filter, with the signal down 20 dB at 50 kHz and 80 dB at 80 kHz.

If you're looking for an even sharper filter there is the XM-107, a four pole filter mounted in an HC-6/U crystal can. This one has the same 15 kHz passband, but is down 40 dB at 42 kHz, which is way, way down there.

We're looking for someone with some good lab gear to try out one of these crystal filters and come up with good before and after bandpass curves using a Tempo FMH or a Standard 146 . . . and volunteers? Write 73 and tell us how soon you'll be able to provide the story.

NEW SILICON RECTIFIER HANDBOOK

Motorola's new 216 page Silicon Rectifier Handbook is a true technical handbook, not a catalog type "data book."

The easily absorbed text is well illustrated, with tables, graphs, and circuits on almost every page. Much material is presented that has never appeared in a rectifier handbook before.

Progressing from basics through the latest rectifier applications, this book is well suited for self study as well as technical reference use. At $2.50 it should be a welcome addition to the solid state bookshelf.

The Silicon Rectifier Handbook may be ordered for $2.50 per single copy, from *Motorola Inc., P.O. Box 20924, Phoenix, Arizona 85036,* or from your nearest Motorola Franchised Distributor.

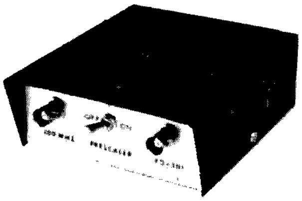
DX QSL GUIDE

Now you can fill out all of your QSL cards in the language of the chap you've worked . . . well, in most of the languages. The K3CHP Guide gives translations into 54 different languages, and that really should just about take care of anything.

The Guide includes not only the basic QSL information in translation, but also such personal things as your age and things like that.

The Guide is available from *K3CHP, 6913 Furman Pky, Riverdale MD 20840* for $3.95 or 30 IRCs.

K ENTERPRISES PRESCALER



A prescaler, in case you're a little behind current technology like the rest of us, is a helpful little piece of test equipment that divides by ten. The fact is it is most useful for anyone messing with the VHF or UHF bands.

You are no doubt aware that counters are so inexpensive and ubiquitous today that frequency meters have been rendered virtually obsolete . . . a very sad development for hams who have invested in General Radio freq meters (which used to sell used for over $2000). One of the limitations of most counters is that they cut off somewhere in the 20–30 MHz range. This is dandy for the low band op, but creates some problems for the chap who wants to put his two meter rig on channel or who wants to try and help fend off the EIA by populating 220 MHz.

The prescaler is just the thing for extending the range of a 30 MHz counter to 300 MHz . . . and K Enterprises happens to have one of the most reasonable and excellent working units yet available. You can also scale down to a low band receiver and do a reasonable job of adjusting VHF frequencies. If you want to zero in on 146.19 you just tune your receiver to 14,619 and you're ready to go.

When the crew at 73 Magazine were setting up the Clegg 220 MHz repeater recently there was a problem . . . how to get the repeater and the transceivers to be used with it all exactly on channel. Even with three different counters on hand, plus two other prescalers (which went to about 150 MHz), nothing worked way up there on 220 MHz. The K-Enterprises prescaler did the job and worked just fine with all three of the counters (Heath, Miida, and Regency).

The PD-301 prescaler comes with built in power supply and preamplifier. It will read a hand transceiver all the way across the room, so it is sensitive . . . and that is one of the problems many ops report with some of the less expensive prescalers. You can't ask for a much better price either, for at $55.50, this is a real bargain today.

More info on the PD-301 and other *K-Enterprises* gadgets is available from them at *1401 North Tucker, Shawnee OK 74801.*

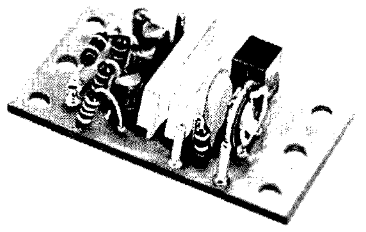
MULTI-PURPOSE RECTIFIER

The Rectifier Components Corporation of Union, New Jersey has recently introduced a new series of 8 pin octal base plug in rectifiers. This series designed "Multi-Purpose Rectifier" (MRP) can be programmed into various rectifier configurations such as center-taps, bridges, voltage multipliers, half wave elements, etc , by simply wiring the 8 pin sockets per the instructions.

The "MPR" series consists of four voltage types with each type containing 4 independent/electrically isolated diode elements. Basic peak reverse voltages at 500, 1000 1500 and 2000 volts are available. Depending on the type of rectifier configuration and device type being programmed rectified current output currents from 0.05 to 3 0 amperes average are obtainable.

Pricing in 1 to 4 quantities is $4.85 $7.35, $9.60 and $12.25 for respective MPR105 (500V), MPR110 (1000V), MRP115 (1500V) and MPR120 (2000V). For more information, contact: *Rectifier Components Corp., 1112 Lousons Rd., Union N.J. 07083.*

MINIATURE PULSE TONE ENCODER



Alpha Electronics Services has been at it again and has come up with an even smaller tone burst oscillator. This one is small enough to fit inside an HT-220 and will provide any frequency from 20–3000 Hz, for a duration of from 0.1–15 seconds. It will even provide a continuous tone if desired. The size is 1½" x 15/16" x ½". Up to eight tones can be generated from one unit. For more info contact *Alpha at 8431 Monroe, Stanton CA 90680.* The AE-50 uses a plug-in thick film hybrid module for frequency determination instead of old fashioned reeds or other mechanical systems.

Alpha also has an encoder-decoder unit which will handle up to six frequencies of tone, from 20–250 Hz. This will fit in most mobile units, but is a bit big for HTs. Ask about the SS-80J-192-F.

DX FOOTNOTES

Gus Browning W4BPD
Drawer "DX"
Cordova, SC 29039

Now with your travelling curtailed on account of the gasoline situation I would think there is more interest in working DX, but, if they start cutting down your power line voltage you had better get yourself some sort of a transformer "arrangement" to boost your line voltage back up to at least enough to make the rig work. Being an old hand in the electronic business all my life I have had many occasions to either need more or maybe less line voltage and this is no problem at all. Get one of those filament transformers out of the attic. If your rig uses about a KW get one that will put out about ten amps or so with the filament voltage you need to boost your line up to. Just put whatever line voltage you have on its primary and correctly polarize the filament voltage in series with the line voltage that goes to your rig. Of course if you need more voltage you can use two transformers or you can use two (or more) windings on the same transformers as long as each winding will put out the amperage your rig needs. (will send anyone a drawing of all this if they send me an sase.)

DX conditions have been pretty good considering the low sunspot count, all you have to do is do a little deeper digging and hunting for the rare ones..They are in there and they are being worked by the serious DX'er. The prefix chasers should be having a real busy time trying-not to miss any of the many FB prefixes that seem to keep changing. Any kind of a big celebration or special event brings out many new prefixes, these are usually a "one shot" deal, if you miss them you may never get another chance to work that prefix again. Some of the prefixes that have been used in the past few months include: ZY2, VA6, SKØ, HW3, VA1, 4K1, XQ3, VA6, CV4, VA7, PT2, PT1, JX4, XG1, 3D6, HAØ, XF4, XX6, JE1, VAØ, HG5, EX5, SY5, VI8, JF1, IB3, DT9, DTØ, WP1, LJ2, KE6, ZM2, KJ3, KJ7 and the list keeps right on growing. The prefix chasers are a busy lot and they can always keep busy if they make up their mind that they don't want to miss any prefixes that pop-up.

Our good friend who lives in Greece near the Mount Athos border has been fairly busy and goes over to Mt. Athos quite frequently where he operates SY5MA. He was W3AG back in the states, he has moved over to Greece now. His QSL manager is W4KA whose CBA is all O.K. He has been quite active on both 20 and 40, seems to like CW better than SSB.

I have received some wonderful mail from readers of this column and I would like to thank them very mucn. The response regarding our new award The Super WTW, the one that will really proves who Works The World, the AWARD that calls the various DX places, "DX Areas" and doesn't use the word countries any more. By the time you are reading this I will have the rules and DX Area lists made up and printed in the form of a "check list" and entry form. I will be glad to send any of you two sets of forms on the receipt of 50c to cover printing & mailing costs. You keep one set for your records and mail me one, we both can keep these forms and use them as you work more DX from the Super WTW list. Of course we will issue you a nice, pretty certificate if you qualify and will have stickers that can be attached to the certificate as you work more from the list. I can definitely state that the fellow who has the highest score in our new Super WTW is the one who has worked more and better DX than anyone else in the world, thats why we call it The Super Worked The World Award ! Do not confuse it with our regular WTW award, they are two completely different awards and the rules are completely different.

If you still need Old VS9K Kamaran Island (in the Red sea, off the coast of Yemen about 3 miles or so) you might keep your eyes and ears open for either (or both), 4W1AF and FL8OM who may go there at a moments notice almost any time, it is possible they may at times also go to other islands in the Red Sea. (ed.- and how about a trip now and then to South Yemen (that's Old Aden-VS9-land, remember them ?). As to when you will hear any activity from Iraq, your guess is as good as mine (maybe better). While we are talking about "rare ones", how about Clipperton Island, just a few hundred miles out in the Pacific from the west coast of northern Mexico. I have as yet to hear a "plausable" explaination why it seems to be "off limits" to hams, why is this anyhow ?, I wonder if there is something "hidden" down there ? Maybe one of these days our Ole Buddy, Barry Goldwater will button hole the French Ambassador up in Washington and get the truth out from him (or would it be more beating around the bush ?). Then there is that place right in the middle of Rome, called The Royal Order of the Knights of Malta. ARRL once told me that it had all the are-marks of being a new country if someone was to go there and operate. Someone who knows their was around and knows the right "official" over there can turn this trick I am sure. They did it with Mount Athos which looked a lot harder than The Royal Order of The Knights of Malta set-up. How about it I1RB ? You seem to "know your way around" pretty well and you know the excitement on the bands when a brand new country shows up.

Does anyone have a circuit of a transistorized multi-vibrator that will lock in on 5 and (by turning a switch) also 10 kc from a sub-harmonic of a 100kc crystal osc. ? I have tried many and have had not much of a success so far. Would like it to be for NPN (of course a FET would be FB too). All I have tried so far are very "touchy" and don't want to start osc. unless you snap power on and off quite a nr of times to get them started. Any help, anyone ?

If you work one of these stations in Turkey and get his address be sure to not mention the word radio on any mail you send him. It seems that all of these ham stations have no legal license and are actually working under cover. In fact it is a good idea to not mention the word radio in quite a few countries, maybe they are legal, but do not want to "rock the boat" ! In fact I know a few stations right here in the U.S.A. that don't want the fact that they are a ham advertised. They would be blamed for every streat, cross-hatch, snow, or even TV trouble their neighbors have ! One fellow down in Miami, Florida has up an "invisable" antenna, it's made of number 28 wire and runs from his 28th. floor hotel room to a building across the street, and he works FB DX and runs a KW. It's really "invisable" that's a fact ! He has been using it for a number of years.

I would like to make up a list of the most needed countries, so how about sending me a list of the ones you need. I will tabulate them all and give the results in this column. It would be a sort of guide to fellows making DXpedition plans and just might activate some of the places you need. Send the list directly here to me and while you are writing me you might send along a few choice DX tidbits, but keep in mind that what I write is not in print for about 2 months. You might also suggest any ways you have in mind to improve this column. We are always open to suggestions.

This is the DX season and I hope you are getting your share. The sun spot cycle are about to start on it's up-hill climb so things should be improving almost anytime now.
on. See you next month, 73 es DX-
Gus BPD

UNDERSTANDING THE SLOW SCAN MONITOR

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Birmingham AL 35210

Our Slow Scan Editor takes us by the hand.

Often prospective Slow Scanners shy away from the fascinating world of SSTV under the misconception that complicated video circuitry is utilized. Other times, Slow Scanners would like to build a monitor of their own design, but are not absolutely sure how to go about it.

It is the objective of this article to describe the simple circuitry used, and give you enough knowledge of the basic monitor so you can plan and/or trouble shoot a typical unit, plus evaluate a monitor's effectiveness by its block diagram or schematic.

Scan monitors are basically simple, while the additional circuitry which makes them more elaborate makes them more complicated. An ideal monitor might be expandable – simple circuitry and spaciously laid out, which we can add onto as desired for increased performance.

Let's start with the basic monitor, which we will divide into two sections for simplicity, and call the "front end" and the "display end." Since the front end is the "business end," (actual Slow Scan circuitry) and the remainder is basically conventional sweep and high voltage circuitry, let's start our discussion with the front and work back. Later we will consider "frills" and troubleshooting techniques.

Monitor Front End

Figure 1 is the block diagram of a typical basic monitor. The Slow Scan TV audio signal first enters a conventional amplifier, which also limits the signal. This gives us a high level, constant amplitude signal we can run through some frequency sensitive circuits, (discriminators) and retrieve the sync and video information.

The pulses appearing at the sync discriminator output are now amplified, detected, and separated (vertical integrator) so they can trigger the proper sweep circuits, either in an oscilloscope or a monitor. During this same period, the signal being fed to the video discriminator (which should pass only 1500 Hz to 2300 Hz) is slope detected: high output for 2300 Hz, low (or zero) for 1500 Hz. Notice that any sync pulses (1200 Hz) making it through the video discriminator still will not be seen, as they will not

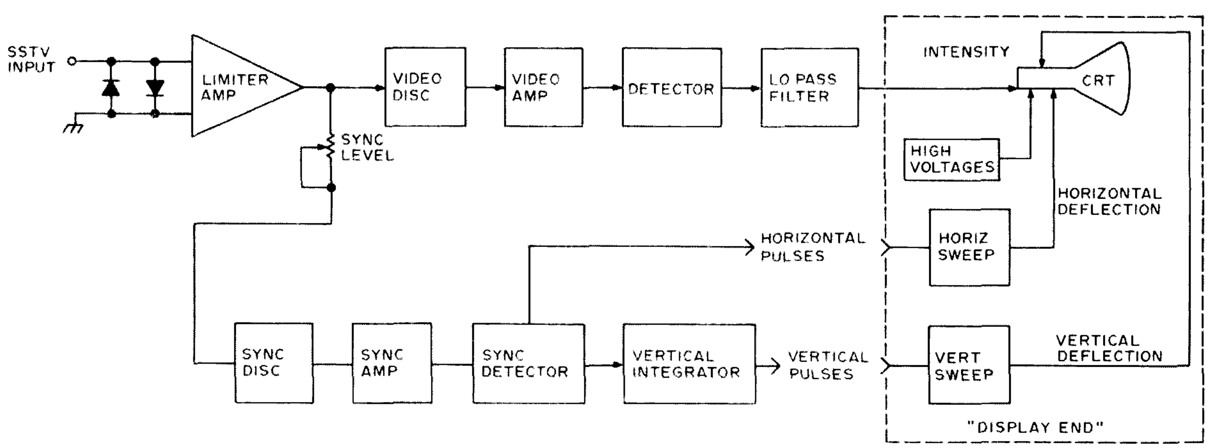

Fig. 1. Block diagram of a typical SSTV monitor.

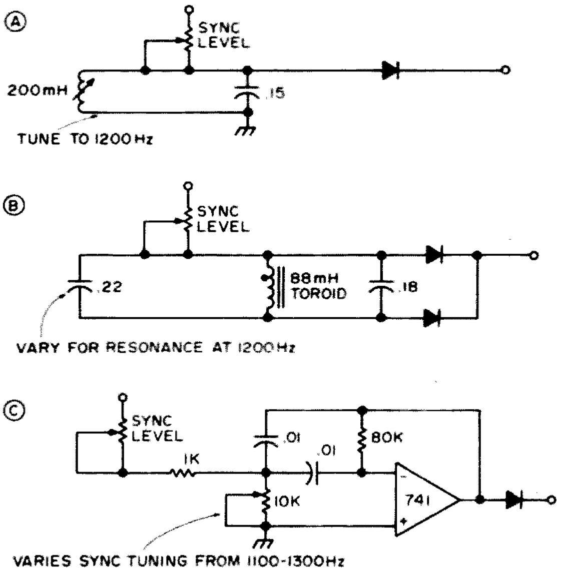

Fig. 2 Typical band pass filters used in sync discriminators.

produce as much voltage as even black frequency (1500 Hz). The voltage now proportional to our received video frequency is amplified, detected, ran through a low pass filter (the last thing we need is "trash" in the video) and then used to intensity modulate the cathode ray tube. Basically, this describes the "front end" operation.

Now let's consider some specifics. The first block the limiter/amplifier, may be any reasonably good audio amplifier, from a one or two tube job to a ua709 integrated circuit unit. All we are after is boosting the level high enough to use. Limiting is necessary so varying levels will not upset picture quality. This is easiest accomplished with back-to-back diodes. (I have the diodes in front of the amplifier because it is easier to clip before amplification.) Next is the sync discriminator, which is a sharply tuned circuit for 1200 Hz. Figure 2 gives some typical examples. Although you can use simple "loopstick" coil/capacitor tuned circuits here, toroidal bandpass filters have a higher Q and better selectivity. Naturally, tunable IC bandpass filters (see *73 Slow Scan TV Handbook*) would be even better and three or four pole filters would be optimum. Resonance may be checked on *any* of our homebrew circuits by connecting it as in Fig. 3, and shifting the audio oscillator's output frequency while comparing on a VOM to find the effectiveness and shaping factor of the tuned circuit. In order to attain the proper level of drive through the tuned circuit, a variable resistor could be used (shown in Fig. 1 as the "sync level pot"). Typical values are 0 to 500K. Once you've obtained the proper level, take the pot out, measure its resistance, and replace it with a fixed resistor of this value. Following the sync discriminator is a straightforward dc amplifier followed by a simple diode detector. This detector converts the output of the sync amplifier into dc pulses, for pulsing our sweep sections. The vertical pulses are separated from the horizontal in the vertical integrator, thus obtaining separate horizontal and vertical pulses. The video discriminator may be a tuned circuit which is broadly resonant (1500 Hz to 2300 Hz) but "peaked" at 2300 Hz, so 1500 Hz gives low output, and 2300 Hz gives high output. Above 2300 Hz this tuned circuit will drop off in output. This voltage is now amplified in a simple dc amplifier. The output is then rectified (interstage transformer probably needed here) then passed through a simple lo-pass filter before being applied to the control grid of the crt (lo-pass filter design for the crt is covered in detail in the *73 Slow Scan TV Handbook*). Full wave rectification would be preferable for both the video and sync detectors for maximum output, and less ripple. I suggest you compare the monitor circuit you are considering to the (typical) block diagram in Fig. 1 for actual circuitry values.

Now assuming you would like to expand an existing monitor, you could add more features as desired. For example, a 1200 Hz bandpass filter might be added between the limiter and the sync discriminator. If we made this a tunable filter, like in the W6MXV monitor, we not only would have a very sharp filter, for eliminating QRM, we could also "move around" slightly in frequency to avoid QRM. A lo-pass filter could

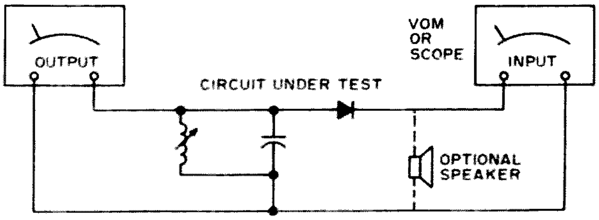

Fig. 3 Test setup for aligning the sync filters.

also be added on the output of the sync discriminator thus making our sync practically noise and QRM free. (Again, specific circuits will be found in the Slow Scan TV Handbook, appx. pg. 46). A pulse shaping integrated circuit could be added in series with the output of the horizontal and vertical "pulse" lines, thus gaining perfect syncing even when only "half a sync pulse" is received. An example of this is WB8DQT's monitor which appeared in August, 1973 *73 Magazine*. A bandpass filter to pass 1500 Hz to 2300 Hz could be placed on the output of the video discriminator to assure only 1500 to 2300 Hz is applied to the video amplifier, thus eliminating QRM to the video. Again, these are "accessories," and not necessary for perfect monitor operation. (However they do help!) The output of our "front end" now consists of horizontal, vertical, and intensity voltages which we may use to drive the "display end."

The Display End

Figure 4 is a basic schematic of a "display end" of a Slow Scan monitor (circuit from WB8DQT circuit in August 1973 *73 Magazine*) and can be driven from any of the conventional Slow Scan circuitry front ends. One example is the 'scope adapter which appeared in June, 1970 *QST*. Note that Fig. 4 has its own horizontal and vertical sweep circuitry, and also the 'scope adapter has its own vertical sweep section (since this is not in oscilloscpes) so we would skip back to the vertical trigger, when rigging these up, rather than having two sweep sections. The outputs, horizontal and vertical, of our "front end" connect through a variable resistor, as shown on the input of Fig. 4. A typical high voltage arrangement is shown in Fig. 5, and can supply voltages to an electromagnetically deflected crt like the 5FP7. I have built some 5 to 10 kV supplies, and always used any "junk" flyback I could find. They all worked fine . . . some had more output voltage than others, but we're not too particular . . . just get some high voltage on the accelerator, and it'll work fine.

Basically, the above is the theory behind all Slow Scan monitors. Some are more sophisticated, but our outline still shows the main parts. Note that any of the front ends may be connected to this, or any other typical display end provided we do it through a variable resistor. Adjust it like

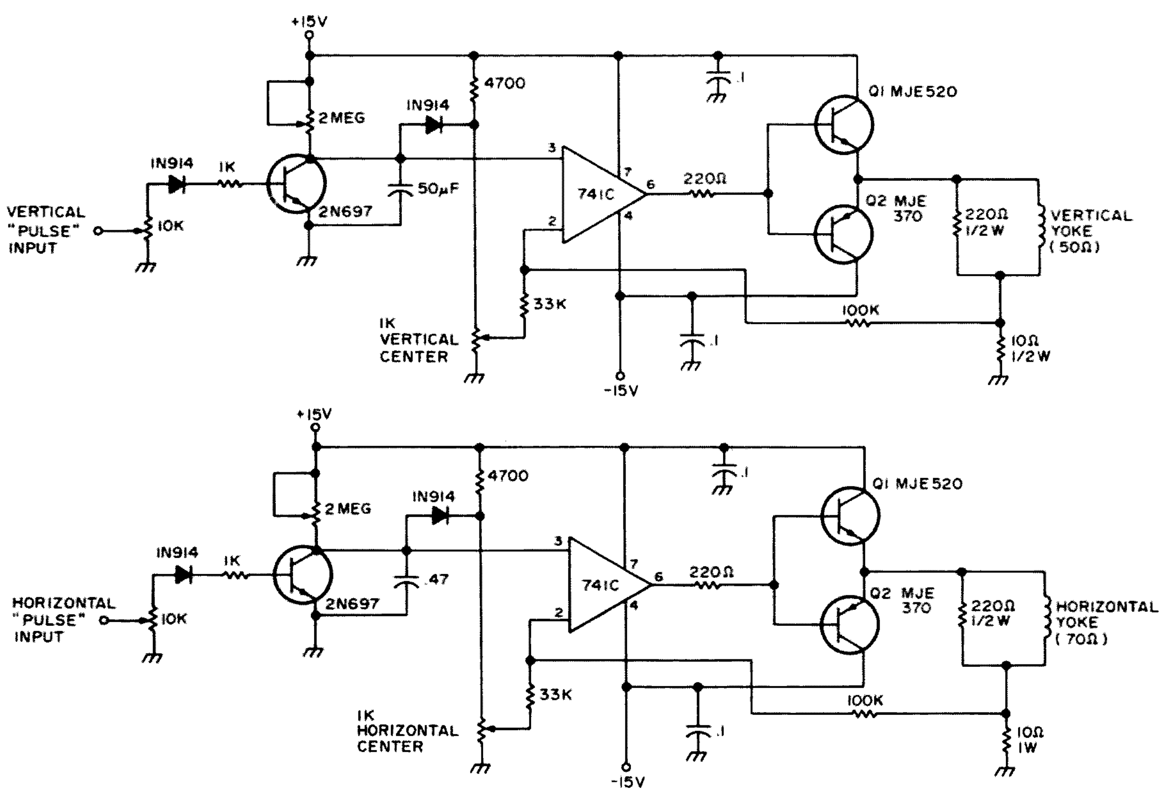

Fig. 4. Vertical and horizontal sweep sections from the "display end."

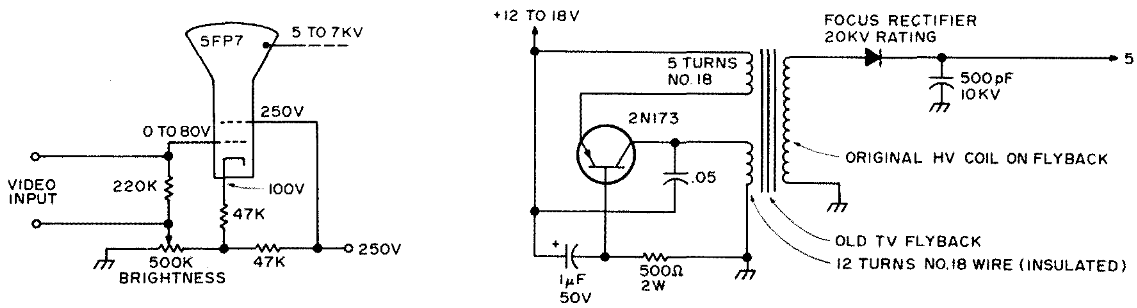

Fig. 5. The crt circuitry and its power supply that will develop 5–7 kV from 12–18V dc.

previously described on the "sync level pot" to drop the level feeding the display end, as overdriving will result in improper syncing and underdriving will not produce sweep.

Monitor Operating Characteristics

Looking at the block diagram in Fig. 1, let's consider what should be happening in a typical monitor upon reception of a Slow Scan signal. The input voltage to the monitor will be too low to read (appx..05V). The limiter's output should be high and probably square wave (appx. 24V peak to peak, or at least 12V as read on a v.o.m.) A pair of phones between here and ground should blow your ears off with audio; The output of the sync amplifier will probably be low (less than .5V) and best measured using an oscilloscope. The output from the sync detector should be pulses at a 15 Hz rate, again measured on an oscilloscope. The output of the vertical integrator should show a pulse every 8 seconds also. The output of the video amplifier should be approximately 0V with an input frequency of 1500 Hz; however, this output should increase (at least above 15V) when the input frequency swings to 2300 Hz. This indicates the resonance of the video discriminator and the slope detection increasing in output as the input SSTV frequency increases. A lo-pass filter will not affect this voltage, thus the video voltage should be apparent at the crt control grid lead.

Moving now to the "display end" we find the two transistors in the horizontal and vertical sweep circuits (Q1 and Q2) used as "triggers," thus the collector on each of these circuits (they are identical except for time constants) will give some indication of pulses, on a vom; the horizontal at a 15 Hz rate (fast "jiggling" of meter pointer) and the vertical with one every eight seconds. The output of the integrated circuits will vary also when scanning. Typical values are ±1V to ±12V (or vice versa – just so it crosses through zero). This voltage will be used to bias the complimentary transistors. The complimentary transistor output circuit (between emitters and ground) will then vary between positive and negative supply voltages, which in this particular case is ±12V. You can almost visualize a raster sweeping (on any monitor) by watching this voltage on a vom. Again, the horizontal "jiggles" up and down at a 15 Hz rate on a vom, while the vertical kicks to approximately 12V and slowly decays down to zero in four seconds, at which time you can turn the meter over and see it start from zero and go up to 4V in the other direction. Should you want to sweep the monitor screen vertically, merely pulse the input to the vertical IC, which will cause the circuit to sweep." Ditto the horizontal.

One of the best ways to assure long, reliable use of Slow Scan gear is to make typical operating measurements, like previously outlined, and record these on a schematic. When future questions arise, we have a known reference guide to then consider.

This article has tried to present, in simple terms, a basic outline on SSTV, primarily focused on the monitor. As you become involved in Slow Scan you will see how these principles may also be applied to the camera and flying spot scanner. I sincerely hope you will find this information useful in future experimentation of this outstanding mode.

. . .K4TWJ

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Santa Monica CA 90406

INTEGRATED CIRCUIT AUDIO AMPLIFIERS

We are now several years into the age of integrated circuits. They are beginning to appear very frequently in schematics in amateur publications. One of the commoner special purpose circuits is the audio amplifier. After all, every receiver has an audio stage, and there is no question that an IC stage requires less space than its discrete component amplifiers in terms of cost and performance. They are getting cheaper and better all the time.

Audio amplifier ICs are therefore of interest to the amateur and experimenter. This article discusses audio amplifier ICs in general, presents some comparative data on some of the commoner varieties, and presents some circuits.

Audio amplifier ICs have a fairly wide variety of configurations and capabilities. Comparisons are complicated because each type (even different types from the same manufacturer) seems to have different types of information specified on its data sheet. Table I attempts to summarize the information from data sheets for a number of devices. Most values are direct from the data sheet. An attempt has been made to convert the sensitivity figures to a common basis from the wide variety of systems used by manufacturers. Table II lists some other audio amplifier ICs for which no data sheets are available.

It will be observed that ICs will deliver moderate powers of 250 mW to 5W. These powers are adequate for amateur usage. (By way of comparison, my HQ-160 is rated at 1W audio output.) Usually they contain an internal amplifier capable of considerable gain. Most are matched to low impedance (4–16Ω) loads, but some require matching transformers. The higher power units will require heat sinking. So far as I know, no chips include built-in overload protection, a feature sometimes built into Hi Fi amplifiers.

Audio ICs are, like other integrated circuits, complete circuit subsystems built on a single silicon chip. The "classical" configuration consits of a differential amplifier feeding a Class B final stage. The use of a Class B final is mandatory because the major problem in integrated circuit design is the dissipation of internally generated heat. The Class B circuit is not only three times as efficient as the Class A configuration, but also it draws only a small idling current at zero drive whereas the Class A configuration must actually dissipate more power at zero drive than at full output. This situation recom-

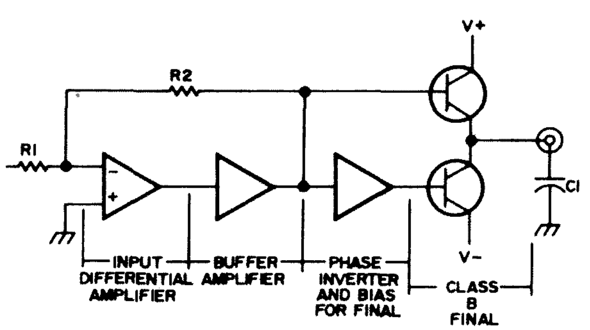


Fig. 1. Basic audio IC. R1 and R2 control voltage gain. C1 is not required if a dual power supply is used (as is shown) but is required for single supply operation. For single supply operation the non--inverting input terminal must be biased above ground.

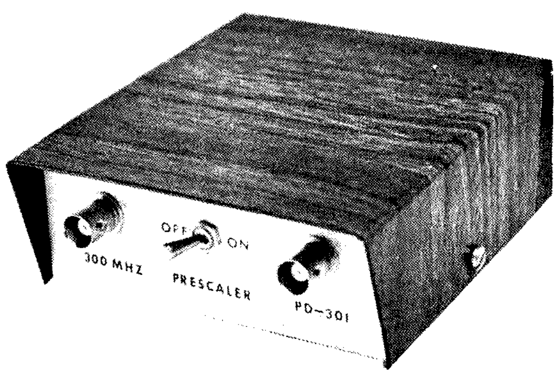
mends against the use of voltage regulator ICs such as the UL723 as audio amplifiers. Voltage regulator ICs utilize Class A output stages.

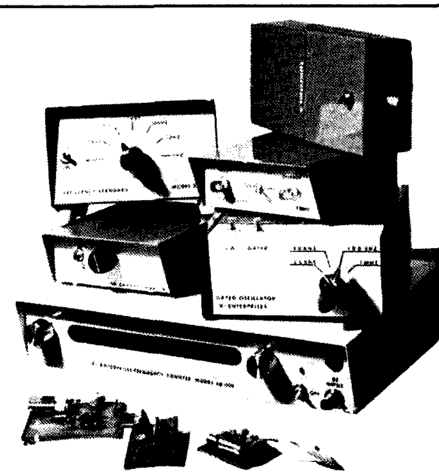
In addition to the input amplifier and output stages, there will be an intermediate phase inverter and possibly a low impedance intermediate amplifier stage. The output from the latter will be brought out to a terminal so that the input amplifier may be treated as an operational amplifier whose gain and frequency response may then be controlled by negative feedback in normal op-amp fashion.

In addition to the input, output, B+, and ground terminals which appear mandatory, a number of other internal points may be brought out to external pins. The op-amp output has already been mentioned. Both the inverting and non-inverting differential amplifier inputs may be brought out to terminals. Whether the latter is true depends to some extent upon another problem. The Class B final will, when driven, produce a signal which varies about a voltage half way between B+ and the most negative voltage applied. If the most negative voltage is ground, considerable biasing is required internally (or externally) to obtain a voltage reference half way between B+ and ground. The circuit can be considerably simplified by the use of a dual power supply – at the cost of requiring two power supplies. Operational amplifiers generally require dual power supplies. IC audio amplifiers on the other hand are designed for consumer products and have (generally) been designed for single supply operation. This requires the use of a high value capacitor in the output circuit and (often) other external biasing components.

There are two special problems in dealing with these ICs – power supplies and feedback. We'll discuss feedback first. Many of these chips have gain capabililities which border on the fantastic. The Amperex TAA300 is specd to be able to deliver 1W output given 10 mV into its input impedance of 10K. This amounts to an 80 dB power gain which is somewhat greater than the difference between its 1W output and the power output of the world's most powerful broadcast transmitters. 80 dB is a lot of gain to package in a TO5 case. A little

K-ENTERPRISES





PRESCALER MODEL PD–301

$55.50 plus $1.50 postage

Model PD 301 is a 300 MHz prescaler designed to extend the range of your counter ten times. This prescaler has a built in preamp with a sensitivity of 50 mV at 150 MHz, 100 mV at 260 MHz, 175 mV at 300 MHz. The 95H90 scaler is rated at 320 MHz. To insure enough drive for all counters, a post amp. was built in. The preamp has a self contained power supply regulated at 5.2V ± .08%. (Input 50 Ohms, Output Hi Z)

All prescalers are shipped in a 4" by 4" by 1¼" cabinet. All are wired and calibrated.

Counters . . . 300 MHz . . . **$350.00**

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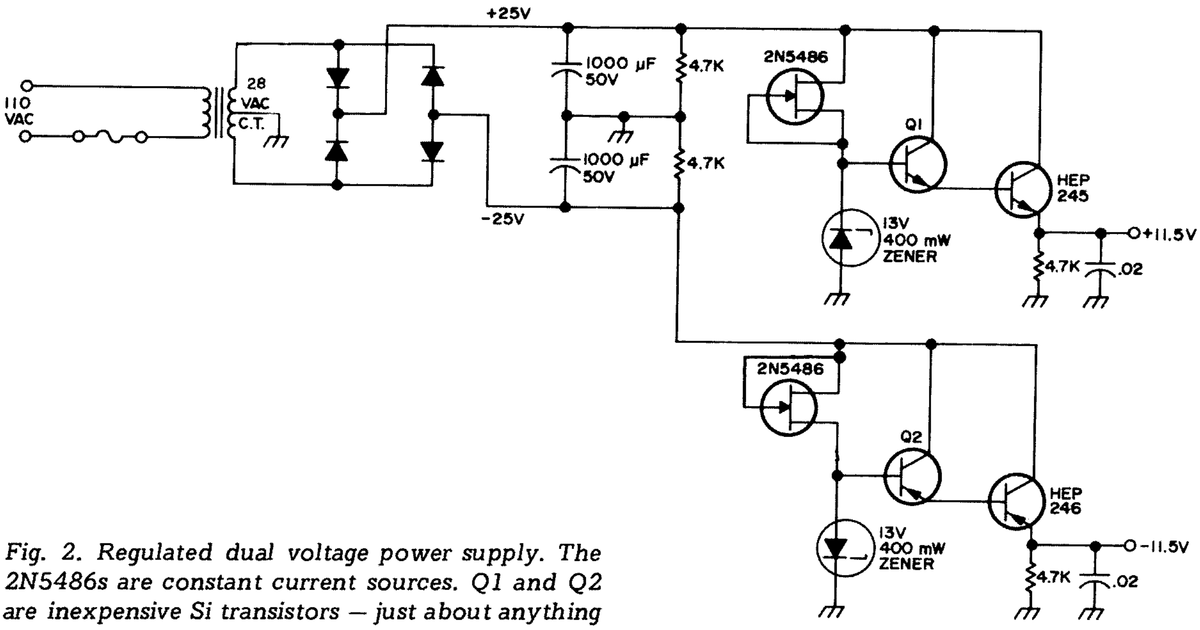


Fig. 2. Regulated dual voltage power supply. The 2N5486s are constant current sources. Q1 and Q2 are inexpensive Si transistors — just about anything will do, although some units will regulate better than others. The HEP245 and HEP246 must *be heatsunk using silicon grease.*

analysis will show that at higher audio frequencies (20 kHz or so), a few pF of capacity back to a non-inverting input terminal is quite sufficient to kick the amplifier into oscillation. Careful circuit layout is important. The obvious (and advisable) alternative of reducing the gain is somewhat alien to the average experimenter. In the world of ICs, gain is cheap and the user is expected to apply some restraint in his design.

The amateur confronted with an oscillating amplifier has several alternatives:

1. Reduce the B+ voltage.

2. Reduce the gain (the data sheet will indicate how).

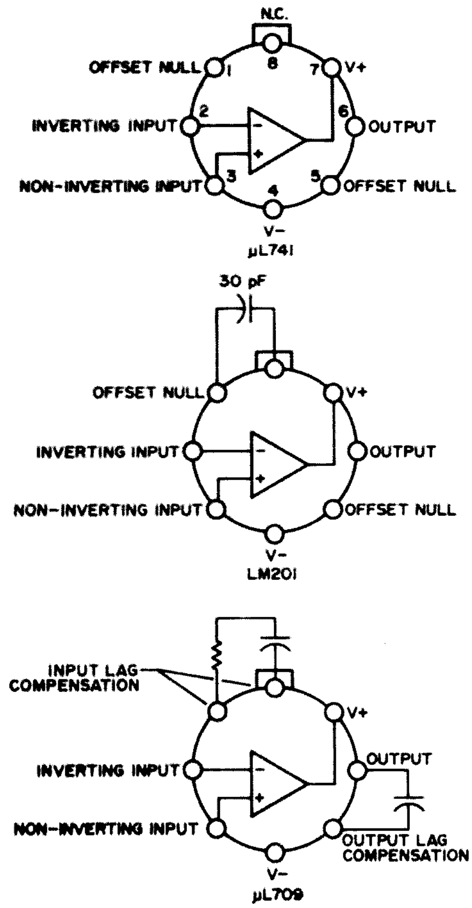
3. Employ negative feedback to reduce the gain.

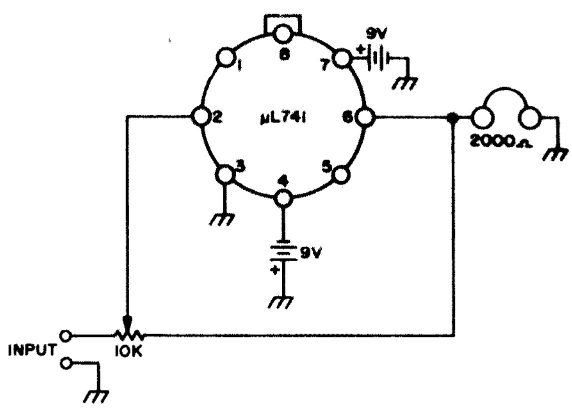
Oscillations don't have to be caused by audio feedback. Most of the chips we are discussing will operate very well at several hundred kHz, or even up to a few dozen MHz. If a few pF can cause feedback problems at audio frequencies, it isn't hard to imagine what a few fractions of a pF can do at a couple of megahertz unless steps are taken to limit the high frequency response. The necessary bypass components (if any) will be indicated on the manufacturer's data sheet. If the IC is to be used in a receiver, one must not forget to put a low pass filter between the detector and the IC if one is not to end up delivering a watt or so of i-f to the amplifier output.

Not all oscillations are caused by feedback through the input stage. They may be caused by the power supply. An output of 1W into an 8Ω load will generate a 3.2V signal drawing 280 mA. Those are rms volts and milliamperes. At the peak, 4.5V at 360 mA will be required on each side of zero. For a single supply, the peak voltage and current will be 9V and 720 mA. 720 mA may not sound very impressive, but it is more than two-thirds of an ampere. Suddenly slapping a 720 mA load on a power supply imposes a load on that power supply, and in typical usage, that load is being turned on and off hundreds of times a second. When a load is imposed on a power supply, the output voltage drops. Depending on the type of supply, the transformer powering it, etc., – the voltage drop might be negligible or it might be catastrophic. A semiconductor regulated supply can be built with a negligible voltage drop. A fresh, large capacity battery will do well also. On the other hand, an unregulated power supply, a low capacity battery, or an old, partially depleted battery will change voltage drastically. In a test, a 750 mA drain on a semiconductor supply showed a drop from 11 to 10.5V. On the other hand, a 330 mA load on a battery

which was (and is) normally used to deliver 3 mA to a FET preamplifier, cut the voltage from 5 to 0.5V. Attempting to operate an IC audio amplifier from a power supply like the latter would be hopeless. The circuit would simply cut itself off whenever it started to deliver any appreciable power, resulting in a thumping low frequency oscillation known as "motorboating."

A regulated power supply is highly recommended for development of the circuit in which the IC is to be run – even if it is eventually to be used with a battery. Figure 2 includes the schematic for a satisfactory power supply. It does not include overload protection except in the sense that the epoxy driving transistors will generally pop before the output transistors expire. Since the Allied/Radio Shack quad pack (catalog 276-530) provides 24 transistors for $1.98, the driving transistors can be socket mounted, and regarded as 8¢ fuses. The 2N5486s are used as constant current sources for the





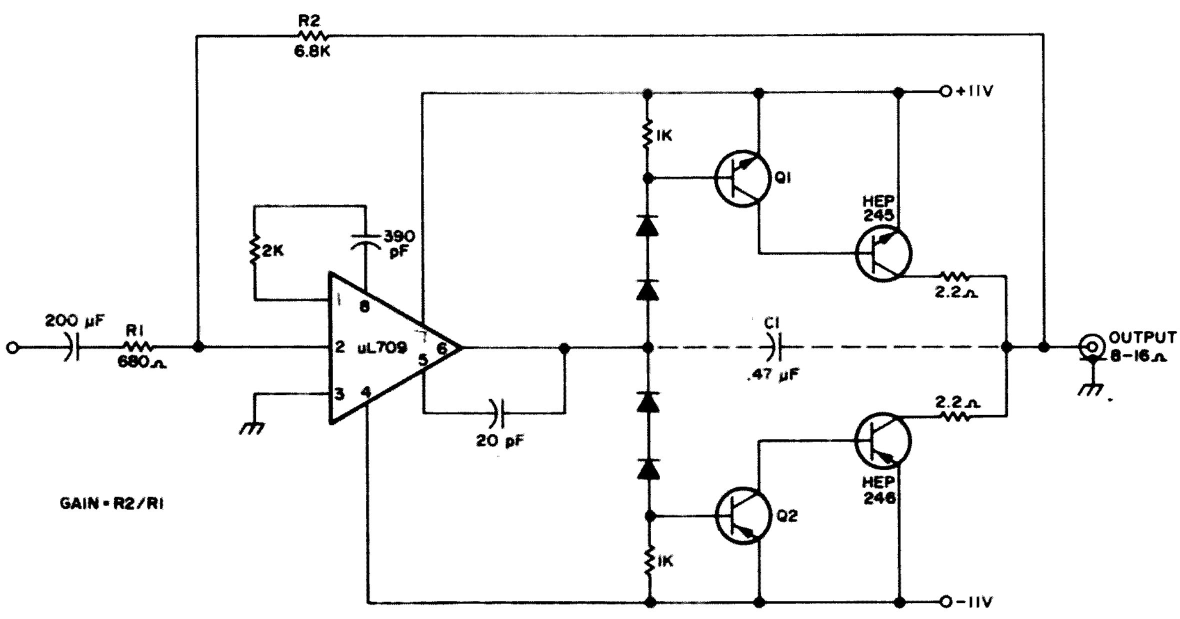


Fig. 3. (a) A very simple op-amp amplifier. (b) Base diagrams for three popular op-amps. (c) An op-amp used as a driver for a high powered output stage.

Table 1 – Audio Amplifier Integrated Circuit Data

Amplifer Type	Power Output	Power Supply	Manufacturer /Source (See Table III)	Input Impedance	Output Impedance	Input for Full Output (Into 8Ω except CA3020)	Zero Output Current Drain	Distortion (Percentage Distortion/ Power)	Price
Discrete	1.4W	Single 9–12V	---/2	2K	8 & 16Ω	6mV	12mA	10%/.8W	6.95
Op Amp	.2–.5W	Dual ±3–18V	Many/1,3,4,6	50K	150–400Ω	See Text	3–5 mA	Unknown	.35¢ up
CA3020)	.550 W	Single 3–9V	RCA/3	1K			(8–35 mA	10%/.55W	2.99
CA3020A)	1W	Single 3–25V	RCA/3	or	200Ω		(14–30 mA	10%/1W	3 49
KD2115)	.55W	Single 3–9V	RCA/4,5	50K			(		see text
MC1454	1.4W	Dual ±8V	Motorola/3	3–10K	0.4Ω	Optional	11–20 mA	5%/1W	3.50
MC1554	1.8W	Dual ±8V	Motorola/3	7–10K	0.2Ω	for all three	11–15 mA	5%/1.1W	17.10
HEP 593	See text	Dual ±8V	Motorola/many	---	---	280 mV,155 mV 75 mV	---	---	7.95
MC1306	.2W	Single 9–12V	Motorola/3	High	0.5Ω	3 mV	4 mA	1%/.2W	1.10
MFC4000P	.25W	Single 3–12V	Motorola/3	Moderate	---	15 mV	6 mA	3%/.2W	.99
TAA300	.8W	Single 6–9V	Amperex/2	10K	1Ω	10 mV	9 mA	3%/.5W	3.95
PA237	2W	Single 9–27V	G.E./unk.	40K	.85Ω	8 mV	3–15 mA	5%/2W	unknown
TT-1W	1W	Single 20V	Westinghouse/1	50–400K	0.3Ω	140 mV	---	5–10%/1W	1.98

Table II – Additional Audio ICs

Ident	Manufacturer/ Source (See Table III)	Power	Price
PA263	G.E./1	1W	2.95
MFC9020	Motorola/3	2W	2.50
C6004	Motorola/3	1W	2.90
C6005	Motorola/3	2W	4.35
C6006	Motorola/3	4W	5.60
SE540L	Signetics/7	Driver	Unknown
NE540L	Signetics/7,1	Driver	2.50
SL630	Plessey/3	Unknown	5.35
SN76001	Texas Inst/3	1W	Unknown
SN76003	Texas Inst/3	3W	Unknown
SN76005	Texas Inst/3	5W	Unknown
SN76013	Texas Inst/3	3W	Unknown
SGS4	Sanken	4W	2.50

Table III – IC Suppliers
(Numbers refer to "source" in Tables I and II)

1. Polypaks P.O. Box 942R Lynnfield MA 01940.	Price does not include postage. 25% deposit on C.O.D.s. No minimum order. Often (but not always) includes data sheets on ICs.
2. Allied/Radio Shack.	Nationwide franchised stores – check your telephone directory. Advertises that items from industrial catalog may be ordered from local stores, which would make most ICs available from them.
3. Circuit Specialists Box 3043 Scottsdale AZ 85257	Add 35¢ for shipping. No minimum order. Sometimes includes data sheets. They indicate they can supply just about any semiconductor or IC, and therefore they may be a good source for Signetics, Motorola, etc., which are not carried by Allied.
4. Allied Industrial 2400 W. Washington Blvd. Chicago IL	Postage is not included. Minimum order is $5, with a $1 handling charge on orders up to $10. Thanks to the nationwide existence of Allied/Radio Shack stores, sales tax is required in most states. Data sheets are not included. See 2 above for an alternative ordering method.
5. Lafayette Corp. 111 Jericho Turnpike Syosset, L.I., NY 11791	Postage not included. Add 50¢ handling charge on orders of less than $5.00. Probably will ship UPS despite explicit request for parcel post.
6. HAL Devices Box 365H Urbana IL 61801	Postage not included, add 75¢. Will ship UPS unless otherwise specified.
7. Signetics Corp 811 East Arques Ave. Sunnyvale CA 94086	Signetics suppliers are hard to come by. A polite letter to this address may produce an indication of who can supply the circuit for you. Alternatively, try source 3 above.

zeners. They require a 4 to 5V voltage drop for proper operation. They can be replaced with resistors selected to set zener current at 5 mA or more at maximum load. The zeners may have to be replaced with higher power units.

If an overload protected supply is to be used, the current limit must be set high enough to permit maximum power peaks to pass. If the amplifier is eventually to be run from a battery supply, a large value capacitor across the power leads will help some in extending the amount of internal resistance which can be tolerated in the battery – thereby extending the useful life of the battery.

One final note before we get into discussion of the individual ICs. Audio amplifier ICs are intended for speech reproduction. This means they must handle voice peaks without distortion. Sine waves pack a lot more energy than typical voice waves. When testing an amplifier with an audio oscillator and a scope, avoid driving the amplifier for any length of time at anywhere near the level at which the wave peaks start to be clipped, since it will probably be delivering far more power than it was designed to deliver, and will shortly correct that situation by melting after which it will not deliver any power at all.

The Amplifiers in Table I.

Discrete. This is a four transistor, transformer coupled amplifier. It requires about six cubic inches of space. It was included to

demonstrate that ICs are competitive with discrete amplifiers in all significant areas.

Op-Amp. We do not ordinarily think of operational amplifiers as audio output stages, primarily because their package dissipations are rather low and their output impedance is rather high. However, when used with high impedance phones or transformer coupled to low impedance phones they will produce all the earphone volume which could possibly be desired. Loudspeaker volume is marginal, but satisfactory for a quiet environment. The amplifier of Fig. 3a has got to be about as simple as you can get: two batteries, a pot, an IC and headphones. It provides a comfortable listening level on 1 mV input. Figure 3c shows the use of an op-amp as a driver. Q1 and Q2 are inexpensive epoxy transistors. The diodes are silicon computer types. The output transistors require heatsinks. R1 and R2 control gain – in Fig. 3c it is set to 10. The capacitor C1 may be required to cut a tendency toward high frequency oscillation. Power output is more than adequate and the fidelity is excellent. Frequency response is flat from 5 Hz to above 100 kHz.

CA3020, CA3020A, KD2115. These are three versions of the same chip which is nominally a high power, wideband amplifier. The KD2115 is sold in a package with 2-KD2114 and 2-KD2116. The price is $5.90, which isn't too bad since the KD2114 is the CA3018 transistor array. The KD2116 seems to be the same as the CA3036 dual darlington array. The CA3020 is somewhat unusual. Among its peculiarities are an optional emitter follower input stage which permits a choice of input impedances; the connection of the final emitters to external contacts to allow emitter resistors to be provided, and a high output impedance which requires transformer coupling. Although excellent for such uses as QRP 40 and 80 meter transmitters, etc., this chip would not be my choice for a receiver audio amplifier.

MC1454, MC1554, HEP593. Again the same chip in three different guises. The MC1554 is the premium version, the MC1454 the commercial version, and the HEP593 is the experimenter's version. An examination of the prices shows that patience in waiting for a mail-ordered MC1454 instead of rushing down to the store to buy an HEP593 is well rewarded. The principal drawback of this IC is the requirement for dual power supplies. If, however, the equipment already had dual supplies and more power was required than the 200 mW or so that can be coaxed out of an op-amp, this would probably be the IC to choose.

MC1306. This is listed in some places as a 500 mW IC, and the maximum package dissipation is even higher. However, the harmonic distortion curve goes through a right angle bend and heads straight up between 200 and 300 mW. Within its power limitations, this is an outstanding bargain at $1.10. The specs are very good. It seems an excellent choice for portable equipment (although my own choice would be the op-amp of Fig. 1a), and for receivers which are generally used with earphones, but may occasionally be used with speakers when demonstrating the radio to friends.

MFC4000P. This is intended for portable radios. It is a four terminal deivce, which is about as simple as you can get. In general, one would be inclined to use it in the same sorts of applications as the MC1306P. It has a lot of gain, and (unlike the MC1306P) no obvious way to control the gain. This could make it somewhat hard to tame.

TAA300. This widely-available IC frequently appears in articles. It requires a heat sink for maximum power output. It will deliver enough power for any reasonable application. Certainly a better choice than the CA3020 for a receiver output stage, the worst problem in using it will probably be that of trying to get anything like the potential sensitivity out of it without feedback problems.

PA237. This IC has appeared as the output stage of many receivers in 73, QST, and Ham Radio during the past two years. The specs are excellent. The greatest difficulty is finding a supplier. You might try your local GE distributor or Circuit Specialists (see Table III).

TT-1W. The specs on this look fine and the price is certainly moderate enough.

Kenney

David Schmarder WA2HNJ
4 Pinwood Circle
Corning NY 14830

A SIMPLE SWEEP GENERATOR FOR MONITOR SCOPES

A short time ago I finished building a monitor scope for my SSB rig and I found that I needed a 30 Hz sweep generator. It had to be a sawtooth wave, so that let out using a 60 Hz sine wave. Not needing a fancy generator I thought back to a simplex experiment that I performed at college using a neon bulb as a relaxation oscillator for producing a sawtooth wave.

This is a simple circuit to understand if a few basic facts are known about neon bulbs. First is its resistance. When the neon bulb is not firing, the resistance is in the megohm range. But when the bulb is firing, heavy conduction occurs which means that the resistance is low. Second, there is a certain voltage that these bulbs will fire at, usually about 70 volts.

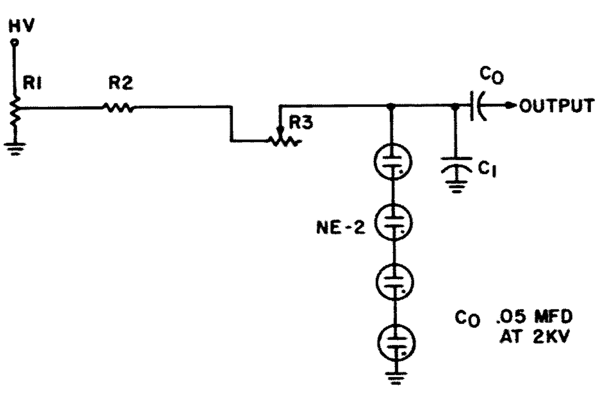


Fig. 1. Circuit diagram.

Referring to the circuit diagram, R2, R3 and C1 is just a simple RC timing circuit. The rate in which the condenser charges, depends on the values of R2, R3 and C1. However, when C1 charges to a certain value of voltage, the neon bulbs which are connected across it will fire and the condenser will then discharge through the neon bulb. Then the condenser will start charging again and the cycle starts over, and a sawtooth wave is being generated.

R1 is a pot which is used as a voltage control for the circuit. The top end of the pot is connected to a voltage source of about 500 volts. The polarity makes no difference. The value of this pot should be at least 500 KΩ.

The neon bulbs are NE-2 type, or what have you. For C1 I used a .005 μF with an adequate voltage rating.

The larger the sweep width you want the more neon bulbs should be placed in series. I found that four bulbs in series gave me a good sweep width.

This circuit I found was the simplest and the cheapest that could be built to produce the sweep needed to make my monitor go.

. . .WA2HNJ

W. Niel Coward K2PMM/F8
c/o 73 MAgazine
Peterborough NH 03458

NEW REGULATIONS (1938)

Those new repeater regulations remind me of a time in ham history, another time in which we were given the business by new regulations. We didn't need them then, either.

On October 4, 1938, the FCC adopted a set of new amateur regulations, effective December 1, 1938. This was a complete rewrite of Chapter XII. Of particular interest to us were Parts 152.41 and 152.42. To quote from *QST*, December 1938, page 14: "No more modulated oscillators and raw ac in the 5-meter band. The requirement to use adequately-filtered dc supply, have stable signals and to avoid over-modulation and frequency modulation is now extended to 60 MHz. The same rules now apply to this band that have previously applied being 30 MHz. *QST* recently took a poll of membership sentiment on this question and found about 87% of the replies in favor of the change, so we are sure it will be generally acceptable. Simple transceivers and self-excited oscillators and other experimental apparatus may still be used above 112 MHz."

The new regulations were the direct result of the ARRL *requesting* a change of rules. The "poll of membership sentiment" mentioned above was taken from QSL or postcard mail returns in answer to the proposal (No. 1) made in the July 1938 issue of *QST*, on page 26. The poll was open *only* to members of the League. Answers could not be qualified; they had to be "Yes" or "No" and they had to be received at ARRL Headquarters by noon of September 1, 1938. It is interesting to note that the ARRL request to change these rules was acted upon by the FCC on October 4, 1938!

Our 5 meter band in those days was 56 to 60 MHz, years later to become part of TV Channel 2 as we were shifted to 50–54 MHz to form the 6 meter band. And these were the pre-World War II depression years. Like most other teen-age hams of that era we had no money to spend on expensive communication receivers, high power tubes and parts required to get us on phone on the lower frequency bands where the action was. However, on 5 meters we could use receiving tubes and other parts scrounged from old broadcast radios. On 5 meters we could talk with our contemporaries, other teenagers with that same inexplicable desire to build,

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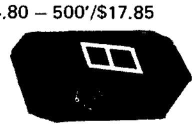

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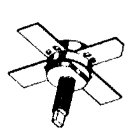

All are Silicon NPN and power output ratings are good to 175 MHZ. Hurry some quantities are limited.

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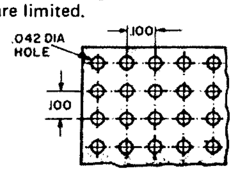

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create, and talk via radio. Most of us were *not* ARRL members and only an occasional 25¢ was spent for a newsstand copy of *QST*. The $2.50 per year for a subscription and membership in the ARRL was more than this teenager earned in a week with his newspaper route.

But we were all having a ball on 5 meters! Receivers were simple super-regens with a 56, 76, or a 6J5 as the detector, followed by two stages of audio. Transmitters were nearly all of the uncomplicated self-excited "TNT" type, using 76's, 45's, or 10's; later the dual triode 53 or the 6A6. Modulators were of the Heising type, where we could use a filter choke as a modulation choke. (Who could afford a modulation transformer?) And the antennas were something. Towers – hah! We used fence wire guyed wood masts made from hand-cut 2 X 2's or spliced bamboo rug poles. Trees, if handy, were also utilized. We built our antennas out of copper wire usually; sometimes we were even able to scrounge (?) an 8-foot piece of ½-inch copper pipe. Coax was something we read about. We used 2-inch spaced open wire feeders with waxed wood spreaders, delta-matched to a vertical half-wave radiator. Twisted lamp cord was frequently used to feed a "J" antenna. Antenna relays were virtually nonexistent. A good many of us used two blade porcelain-base knife switches stocked by hardware stores for antenna changeover. The more sophisticated 5 meter stations had *two* antennas, one for receiving and the other for transmitting. With this arrangement we found we could work *duplex*! Here was the height of hamming!

Then the roof fell in on December 1, 1938. Suddenly 5 meters became a vast, almost empty, wasteland. Where was that 87%? We suspected they had never left 20 and 75 meters in the first place. Too late we realized that limiting that poll to ARRL members was decidedly unfair. Right up to our entry into World War II in December of 1941, 5 meters remained unused for all practical purposes.

Will we see a similar fate result in repeater activity?

...K2PMM/F8

Al Lee KH6HDM
204 Makee Road
Honolulu HI 96815

QUICK 'N EASY 15 OR 20 METER VERTICAL

For quick'n easy contacts.

A vertical for 15 or 20 meter operation is real easy and inexpensive to put up. In a clear and open space, drive a wooden stake in the earth for about one foot. This is the base for a TV pole which has been loosely attached to a second pole with two "U" clamps (see Fig. 1 and Parts List). By sliding the second pole trombone-style, one can adjust the second pole from the ground for later tuning with an swr meter. I set the height off the ground of the lower end of the vertical at three feet more or less.

Now three lengths of nylon line are attached to the upper "U" clamp and the vertical is elevated by lashing the TV pole to the driven stake and fixing the lengths of nylon line to the driven steady stakes. Your vertical is now in the air and can be firmed up at the base and with the nylon guys.

Pick out your choice of operation of either 15 or 20 meters and fix the TV pole length at a test length of 320 cm for 15 meters or 470 cm for 20 meters. Put the third and last "U" clamp at the base around the wooden stake and the TV pole. A short length of wire from the "U" clamp to one side of the coax connector will complete the vertical part of this antenna.

The Radial System

Your quarter wave ground plane vertical will work best with a wire radial system which is quick and easy to make. For instance, for 15 meters cut four radials 320 cm long and fix insulators with connecting nylon lines. One end of the nylon line is attached to the wooden stake base of the vertical. A lead from each radial is joined to fix to the other side of the coax connector. Each end of the radial is fanned out to 90° and stakes support the other end of the radial wires which are attached to the insulators. Wire length for 20 meter operation I found to be 470 cm.

Adjustment

With your swr meter and a transmitted signal you can bring your Quick 'N Easy vertical quite close to 1:1 by adjusting the length of the vertical element. Then tighten the "U" clamps which hold the two poles together.

Raising and lowering the radial attachment at the base of the vertical will give a good impedance match with improved swr reading. From the tie down, the radials are parallel with the ground.

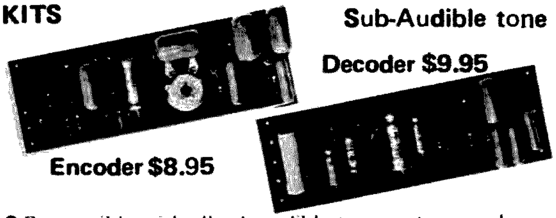
Modifications

There are several modifications with which you might experiment.

First, you could try substituting a water pipe, sprinkler system, or a rod driven in the earth for the radial system. Also, I've added a base tuner to this type of grounding system. Chicken wire stretched from the vertical base will act almost as well as the radial wires. In your shack, you could use a

KITS

Sub-Audible tone



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long wire tuner with any of these arrays. With my long wire tuner I have worked both 15 and 20 meters with this vertical and a good water pipe ground. A variation here with your long wire tuner might be that you could join together the center, and the braid of the coax, so that the verticals, radials, and the transmission line might act as a quarter wave for tuning in all of the amateur bands. All this can be worked and tuned against a ground obtained from a water pipe.

Beautiful gain can be obtained by constructing a second antenna a correct distance away for directional phasing. Tapped coils at the base and in line traps could find you enough research challenges to keep you off that third stool in Joe's Bar for several months.

TV poles can be easily fitted into each other and guyed so that a 40 and 80 meter vertical can be constructed. I haven't tried this yet.

Comparison

I've had a chance to compare the Quick 'N Easy vertical with a commercial vertical which is 550 cm high with 1000 cm radials operating as a type of compromise on both 15 and 20 meters. My vertical will outperform this unit and has a better swr across the band.

Advantages

This type of antenna has many advantages.

First, one builds this antenna in the absence of formulas, slide rules, calculators, a lot of real estate or a great knowledge of electronics. Your transmitter, an swr meter and a little limberness is all that is needed.

Second, the vertical is built just off the ground with no necessity of poles, towers or high trees. This reduces the costs and the objections of your XYL or neighbors.

Third, there is no need to climb ladders, towers, trees, the roof, or fences.

Adjustments for improved frequency and impedance are done by merely tilting the vertical element after loosening the supports. The radials are right at hand for changing lengths, direction, height above the earth and the angle at which the radials leave the vertical element. The placing of the antenna

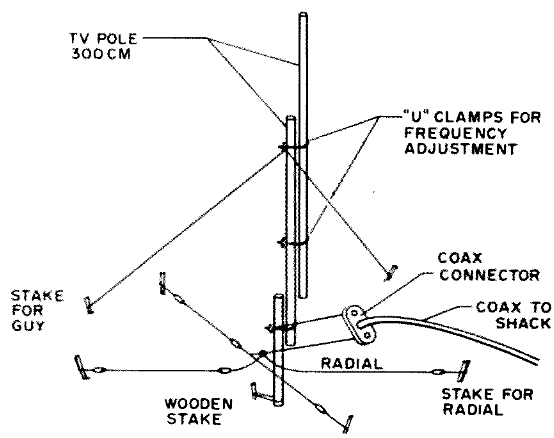

Fig. 1. Quick 'N Easy 15 or 20 meter vertical made with two 300 cm TV poles and a ground radial system.

Parts List

2 – 300 cm TV poles.
3 – "U" clamps to fit across the poles.
5 – wooden stakes.
1 – coax connector (such as HQ1, Budwig Manufacturing Company, Box 97, Ramona CA 92065. Price $2.95).
1 – roll of nylon line (#20, Sears Roebuck & Company. Price $1.29).
1 – 1500 cm of #12 or thereabouts wire.
8 – insulators.

in its functioning position is simple, with minimal effort, with no pulleys, cranks, climbing or other hazards.

Some arrays costing manyfold more than this simple antenna are often out of resonance plus other problems which reduce the efficiency, causing TVI and other critical situations. Solutions and corrections to these problems in more complicated arrays take instruments and experience which aren't easy to come by.

This vertical depends on its radials, with no need for a particular type of ground or earth and the radials bring a simple ground right up to the level of antenna function.

Be sure to put the antenna out in the clear, as the maximal current at the base of the vertical with the low angle of radiation will defeat this type of installation in a

Table I

	15m	20m
Vert. el.	320 cm	470 cm
Radial length	320 cm	470 cm
Height of base from ground	90 cm	120 cm

Four radials are used on each band.

boxed-in location. For example, I once installed a store-bought vertical close to the house near a tree. After I cut the limbs off the tree and made my XYL hopping mad, I moved it into the clear. The antenna worked great, but I still get static on that darned tree.

Last summer I constructed two phased 40 meter verticals in the border of our yard. The rf was so completely absorbed that a strong wind would only carry my signal a couple of blocks.

Lastly, I tried an aluminum rod over the balcony of this steel monster high-rise condominium. This tipped-over vertical pushed all of the rf into the building. I now use my fish-pole antenna which clears the building and it works great.

So, be sure to put the Quick 'N Easy in the clear. I've learned.

The measurements in Table I give you the set of figures in my QTH with its set of circumstances. You may need to try your own measurements. So pick up courage and be with it.

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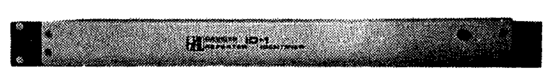

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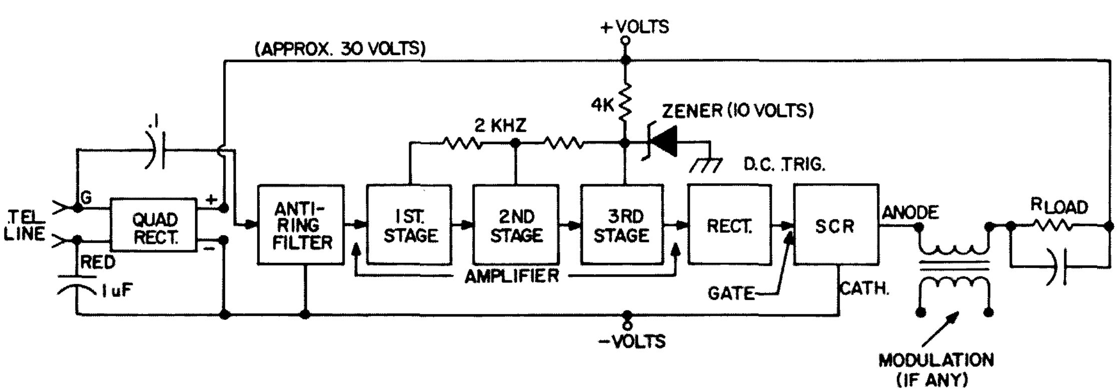

Fig. 1. Block diagram, 2 kHz amplifier.

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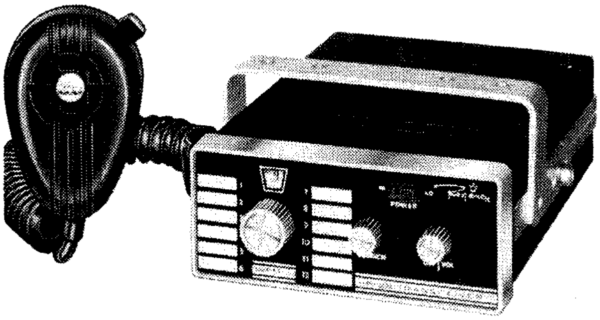

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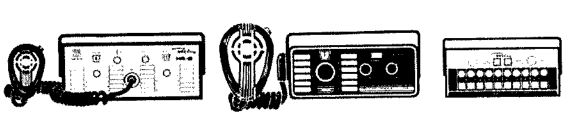

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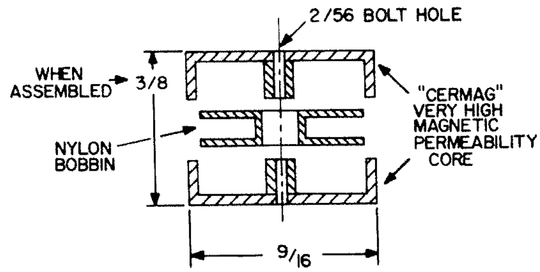

Fig. 2. Cup core for 2 kHz amplifier.

branched off, you can actuate, by different beeper tones, almost anything you want, including your rig. So, start building.

Figure 1, block diagram, shows the essentials of the amplifier, where the input and output circuit are the principal items differing from "radio" work. The amplifier itself is essentially the same as an i-f job, just on a lower frequency. So low in fact that you can listen to it if you want to, being on 2000 Hz.

The coils can be wound by the amateur builder once the high-permeability (magnetic) cup-cores are obtained. Addresses of suppliers are included.

Various additional telephone circuits are shown to give you a few ideas of what can be done for systems you might like to dream up yourself. The input and output circuits will be detailed last because these will be of your own choice, and not necessarily the same as the examples shown here.

The Tuned Amplifier

Tuned circuits are the bread and butter, also the main course, in radio work by the home-brewer. Before the days of crystal filters for everybody, sound waves in metal, and the newer ceramic resonators, i-f circuits for narrow band CW work were put on 50 kHz with expensive transformers using Litz (many strands of enamelled wire forming one wire) wire and air-variable capacitors for tuning. They worked, but were large and not low cost. Then came the era of high magnetic permeability materials, which, in the shape of a small cup-core, see Fig. 2, about 1/2" cube with as little as thirty turns of wire, could be tuned to 100 kHz. From this work came the little 1/4" 455 kHz i-f jobs produced in the many millions by the "Nagasaki Hardware" companies. Also,

sticking closer to home, "Cermag" cores, and similar items with a magnetic permeability several thousand times greater than air became available. Figure 2 shows size and shape of one of these, with a nice little bobbin for winding the coil included by some suppliers.

This particular design does not have the familiar i-f tuning slug but does allow you to wind up a tuned circuit for 2 kHz which is the goal in this article. The lack of the tuning slug can be overcome by the use of several fixed capacitors across the coil, the value of these capacitors being determined by the handy little item shown in Fig. 3 which takes the place of a variable capacitor quite nicely at those frequencies. Steps of 1000 pF are quite adequate for use at 2 kHz or whichever of the telephone audio frequencies you wish to use. You can see the problem at a glance; 455 kHz coils need capacitors in the range of 100 – 500 pF, 135 kHz units can use up to 2000 pF or more, but at 2 kHz you need tuning capacitors in the 50,000 to 100,000 range.

I have seen, in days gone by, variable electrolitic capacitors that could tune those values, even up to several μF, but doubt very much if any are now available today. At any rate they would not do a good job here being made of a pool of electrolyte with a coating (anodic) of thin insulation on the rotary vane dipping into it.

So, let's get into the coil details. On the bobbin shown in Fig. 2, wind some 240 turns of #36 enamel wire. The exact number is not too important because you have to tune them up individually with fixed capaci-

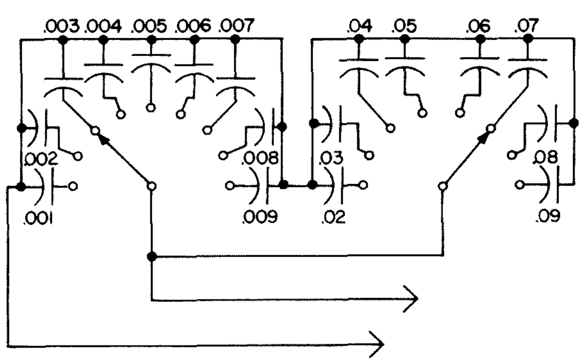

Fig. 3. Variable capacitor, 1000 – 100,000 pF (2 kHz amplifier).

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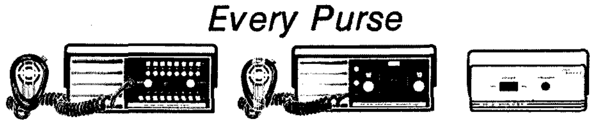

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2 Meter FM
Power Amplifier

tors, using the capacity box of Fig. 3. You can, of course, do without that item but it takes longer and that box is very handy to have around an experimenter-builder's shack anyway. The winding can be done by hand using the setup shown in Fig. 4, which is the way I did it, and it is not too hard. Fasten a hand drill in a vise on the edge of the table, use a 2/56 bolt as in Fig. 4b, and wind. The hand drill I have gives about four turns of the chuck to one turn of the crank, so that makes counting easier. After winding on the 240 turns, wind the secondary on top of that, being sure to use different wire, or at least be sure and identify the windings. You can easily tell with an ohmmeter, but it's better to be sure first about such things. I used single silk-covered #38 for the secondary.

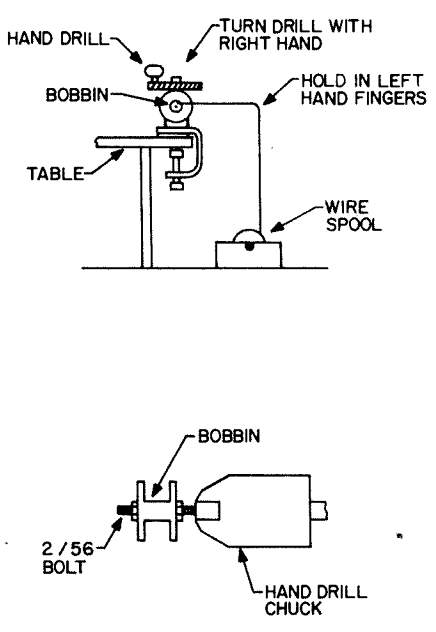


Fig. 4. Hand winding set-up (2 kHz amplifier).

The number of turns on the secondary, which will feed the next base input, can be very important. I found ten turns to be enough for the interstage transformers, and eighty turns for the last transformer feeding the diode. The number of these turns plus the coupling capacitor to the base, have a large effect on the gain, reduction of self-oscillation caused by feedback, and rejection of the ringing voltage. A tendency towards more coupling turns and less capacitor is probably best.

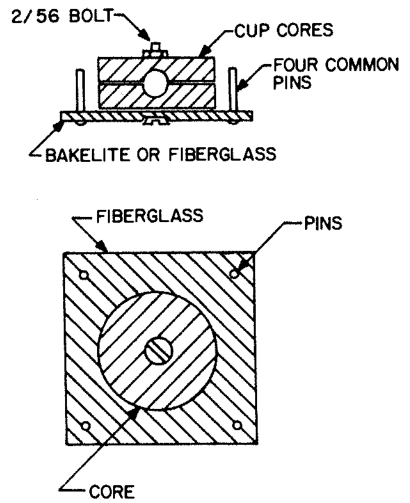


Fig. 5. Transformer core mount (2 kHz amplifier).

After winding, insert the bobbin carefully into one of the cup cores and place the other half over it, taking care to line up the core slots so that the four wires can be brought easily out. Keeping the slots lined up (see Fig. 5a) insert and tighten the 2/56 bolt and nut through the center of the cores. In case you wish to make a miniature job out of it, the transformer mounting method shown in Fig. 5 may help. Drill the pin holes shown one size smaller than a common pin, which may call for an .020 hole and a number 76 drill, and hammer them carefully into the bakelite or fiberglass squares using soft soap for lubrication. You will probably have to use a micrometer in this work. Put a piece of insulation, such as 5 mil fiberglass under the square plate to keep the pin heads from touching the copper, if you use a copper-clad board to mount them on.

Figure 6 shows one of the transformer circuits with several fixed capacitors for tuning. After finding the correct value using the method shown in Fig. 3, DO NOT rely on the values printed on said capacitors,

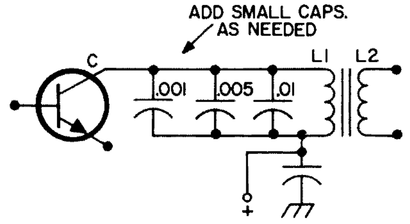


Fig. 6. Added capacitors for 2 kHz tuning of transformers.

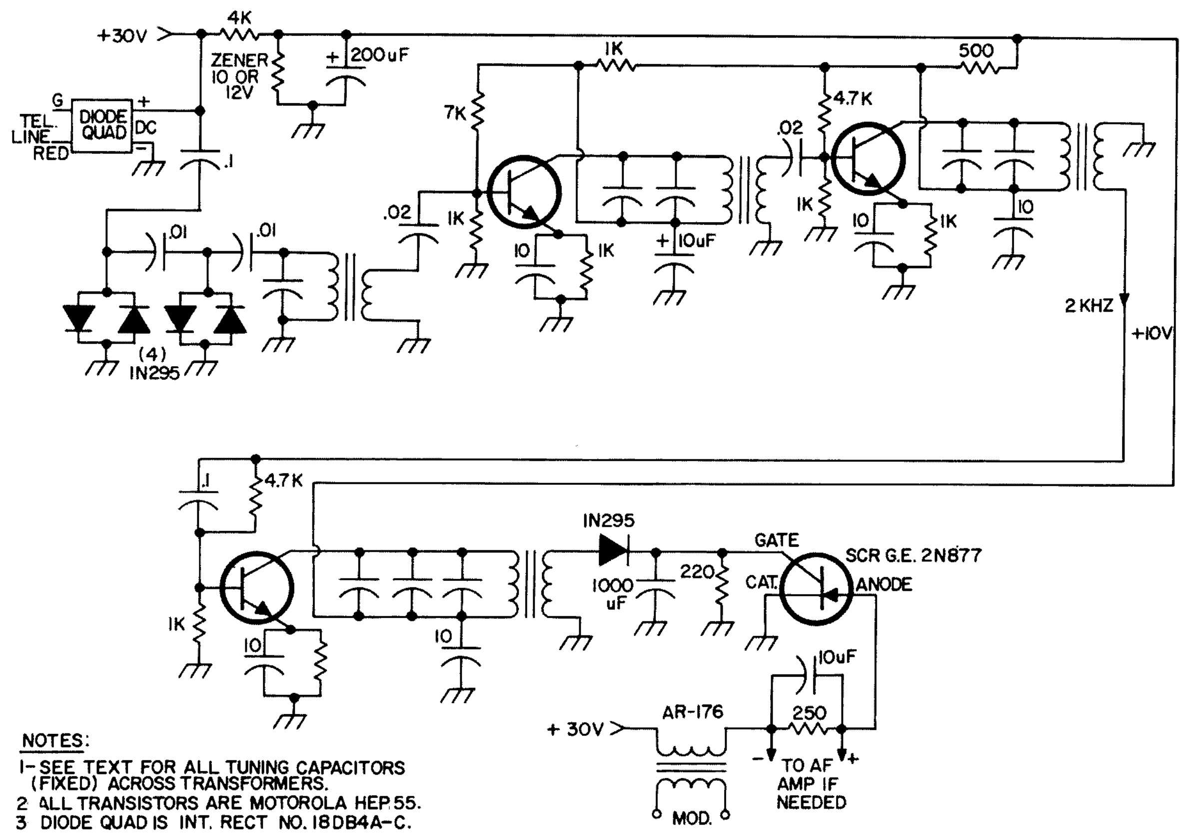


Fig. 7. Schematic of 2 kHz amplifier.

unless they are high precision, high cost jobs, which is not necessary. Just use your signal generator carefully and watch your ac voltmeter across the last secondary, put them all on the same frequency, and check after all three stages are working. DO NOT rely on guess work for this item. With a selection of .001, .01, and possibly .02 or .05 capacitors, you will do alright. If you need some of these in a hurry, you can find a selection at one of the Radio Shack stores. You can, of course, use a variety of loose capacitors and clip leads if you don't want to make up the box shown in Fig. 3.

The Circuit

Figure 7 shows the complete circuit including the anti-ring input filter, the dc power leads, and the scr output section, any of which you may or may not want.

Note the series B plus filtering to each stage which is quite essential at these frequencies. The total gain available with three transistors is quite high but is kept down, along with self-oscillation, and the bandwidth sharpness is kept up, by the use of small secondaries on the interstage transformers and careful choice of base input capacitors. Anti-ringing is greatly controlled by the size of the base capacitors, so watch this point. Between about 1–5 mV at the input gives 5 or 6V at the output, with clean and stable amplification and no oscillation.

Do not be surprised if, on listening to the output, you hear a two kHz tone without the signal generator being connected! Remember that you can tune in on the output of a high gain i-f system with a suitable receiver. Well, you can do just this here but as the amplifier is on an audible frequency you will now be able to hear it directly by ear.

Due to the large number of turns of small wire in the collector circuits, with 100 – 200Ω of dc resistance, do not expect too much power in each stage. All we need for turning on the solid state relay (scr) (pick the right one in the G.E. catalog, 2N877 is used here) is some 4 – 5/10V and not too many μA.

Low Frequency Signal Generator

A low cost sine wave/square wave generator running from 20 – 200 kHz was used

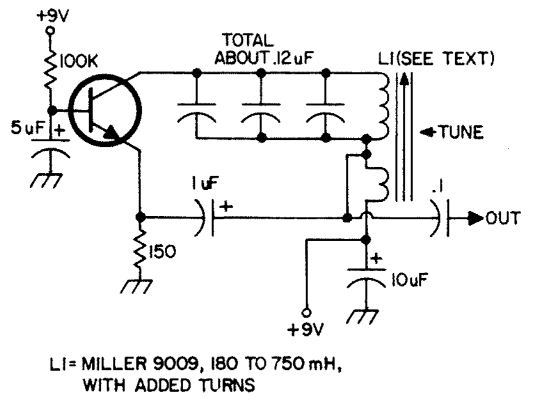


Fig. 8. Test oscillator – sig. – gen. 2 kHz.

here for the signal source, but if you don't have one on hand you can use a 2 kHz oscillator, an example of which is shown in Fig. 8. You will have to calibrate it from some other lad's generator in this case.

L1 may be one of the cup cores shown in Figs. 2 and 5, or you can use a Miller adjustable inductor, #9009, 180 – 750 mH, by adding some 80 turns as shown in Fig. 8. Be sure and add them in the same direction and connect them so they add. You can then tune it with the adjustable core to match the precise frequency of the amplifier. One circuit is easier to tune than four!

I find about 5 – 6V ac (2000 Hz) at the collector and about .1V at the output tap shown. I also used a variable attenuator, audio type, to cut this down to a few mV for use as the amplifier gain grew towards it's final figure. I should mention here that you can plan on four stages if you like, to give you more of everything you need, like gain, narrower bandwidth, more ring rejection, etc., but this is up to you.

If you are going to do much of this low frequency work you will probably have considerable need for a "store-bought" generator, which generally will have both sine and square wave outputs and run from 20 – 20,000 Hz in frequency.

Input Filter

If you wish to operate your decoder without being troubled by the terrific 70 – 100V ac at 20 Hz plus some inductive cut-off pulses much higher in voltage than that (and in frequency components too!) which come in with the ringing signal, I found that three items were needed besides good selectivity in the main amplifier. These are, the Zener diode and bypass to hold down the line-derived 10V dc power supply for the amplifier; the scr gate input filter and its turn-off resistor; and the input filter being described.

The ring voltage is supposed to be 20 Hz, but just wait until you see that inductive kick on a scope! It has a real bang to it and it is hard to keep it from ringing the coils and triggering the scr gate. One of the biggest aids to cutting these pulses down to size is the input filter shown in Fig. 7, the main schematic. The use of capacitors that "favor" 2 kHz and cut down 20 cycles is seen, plus four diodes in between, in reverse polarity pairs. You have to put this item right up in the front end otherwise it would cut down the 2 kHz also. As it is, some reduction of the desired tone signal occurs, but is not severe, whereas removing the diodes does let the ring voltage kick off the scr gate. If you do let one of those big ring pulses hit the resonant 2 kHz coils, you'll never be able to stop them ringing on pulses, which you do not want. As it is, some of the pulse does get through but greatly reduced by the four diodes.

The 2 kHz, at a relatively low input level of a few mV gets by those diodes with only a little attenuation, and by integration (steady addition and build up) through the amplifier builds up to some 5 or 6V ac at the third stage collector pin. Nothing stops you from putting more sections in the input filter if you want, but as shown the whole circuit triggers every time on tone and never triggers on the ring. What more could you want?

The Zener Diode

The ring voltage, that 70V plus ac across the line, acting on the quad automatic polarity reversing switch, caused a build-up in the line-derived amplifier B+ circuit from, for example, 10V up to 15V. Then, when that big cut-off pulse arrived on top of the 15V, the scr sometimes triggered. You couldn't live with this, so a zener diode of 10V was installed across the plus 10V, and also a large capacitor of 200 μF. This did the

job in fine style. The 10V stays at ten right through the ring and that item was cured.

The large scr gate capacitor of 1000 μF was the final nail that held those ringing pulses down from triggering the scr. The tone signal of course, holds on for a time determined by the finger on the tone signal oscillator, which may be miles away. The total integration through the system, including that 1000 μF job, is long enough to keep the pulses down but allow the desired 2 kHz through and build up the dc on the gate to where it will trigger the scr. This takes a certain number of milliseconds, as you will see.

However, once you put that 1000 μF on the gate you have to think about how you're going to turn off the scr when you want to. Those smart little "controlled rectifiers" are nicely controlled as to turn-on, but not at all so for the turn-off! Not only does the gate lose control when the anode is latched on, but even a momentary break in the anode voltage will do no good if the gate is still positive. With the scr indicated and 1000 μF across the gate I found that over 450Ω for R1 in Fig. 9 would discharge C1 fast enough to cut off the anode latch-up, while less than 100Ω would prove too low for a good dc trigger build up. 250Ω for R1 does work "de-latching" the scr nicely every time you hang up the remote handset, which causes a reversal of the input polarity of the line. This causes a momentary drop to zero of the scr anode, which is long enough for R1 to discharge C1.

The SCR

These little wonders require a little getting used to but are quite likeable devices once you get the hang of them. They do turn on every time the gate hits about 4/10V positive, at quite a low number of μA, and they also turn off every time you break the anode circuit for even a few microseconds. That is, providing the gate is not left hanging up on positive dc. Just be sure and use the right scr for the job. The one in the schematic is the G.E. 2N877.

The books on these marvels, and even the specs included with the package, are in themselves marvels of obscurantism (the practice of pretending to let you know what is going on, but making sure that only the initiated can actually make anything useful out of what you are saying) and I only hope you can wade through them and find out what they mean. In fairness to G.E., and others too, I should say that this is a very common fault. A specialized branch of semiconductor technique such as silicon controlled rectifiers has to develop new words in order to talk about something never before made. However, they do not explain either the new words or the new methods with anything like the clarity needed by someone starting in to work with scr.

You will find things like graphs with big shaded areas indicating "minimum turn on voltage from minus so and so C to plus so and so C." Don't worry about that one unless you're going to take the amplifier to Alaska and then down to the equator. In planes or in space that's a different thing.

Figure 9 shows the scr circuit I used which works fine for the purpose shown. Once the scr is triggered it stays on, but good. The 220Ω load shown looks like the handset you did not lift off the cradle (because you weren't there) and central office can't tell the difference so it obligingly accepts the line termination (220Ω) cuts off the ringing, and gives a busy signal to anyone else that calls afterwards, and lets you proceed with your remote business as needed by your system. As mentioned, you can also talk on the air, and receive voice also.

Note that the anode voltage must drop or pass through zero level for the scr to turn off. This occurs automatically when you hang up so that's taken care of.

There is a slight question of different telephone companies having perhaps different voltages and sensitivities to line termination resistances, but I have been assured that

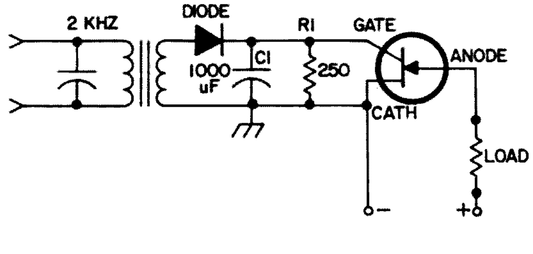


Fig. 9. SCR circuit.

most of them are pretty well standardized on these points. The line I use is in northern New England.

Power Supply

This can get a little tricky. First of all it is perfectly possible to use the telephone line as the power supply because you can find a nice 42V waiting for you across the red and green wires. However, as soon as the connection is made to the desired number and either the line is terminated by the 220Ω resistor, or the handset is picked up, the polarity reverses with a bang. This is called "tipping" by telephone companies. This in itself is not too bad as the diode quad switch automatically gives you plus on one of it's dc output wires, and a 4K resistor brings this down to 10V, and the zener diode holds it there. However, there is one little fly in the ointment, if the telephone company checks this line and finds a resistance of something like 5 to 10 thousand Ω across your line and a merry little 10 mils draining out on a steady state basis? I have been told that they may have a slight aversion to this state of affairs, so don't say I didn't warn you. It just means you might have to furnish your own 10V. At a tenth of a watt a 100 ampere hour charged battery would last 10,000 hours, unless my arithmetic fails me (which is quite easy). So that's about 400 days.

Also, most repeaters have an ac line around anyway. If you have to run one up to a mountain, be prepared for a lot of hard work. I did this for 1/2 mile up the last 1000 feet of elevation of a 3000 footer in 1950, and I know.

Bandwidth

On this parameter depends the number of tone code channels you can build into a proposed system. Here are the figures I found for the finished unit exactly as shown in Fig. 7: 10 dB down at 280 Hz (140 each side of center), and 25 dB down at 600 Hz. Granted, you are hemmed in on the low frequency side by the increasing size of the tuned circuits, and on the high frequency side by the inherent cut-off of a normal telephone voice circuit. However, you could get ten channels in between 500 and 4000 Hz, with luck. Some lads go lower than 500 also, I understand. For normal repeater work you won't need that many anyway.

Talk Back

You can modulate the line very easily, to listen to a receiver on the air, or whatever use you may wish. Figure 7 shows the easy way to do it by simply including a Lafayette, or similar, AR-176 transformer in series with the line. This has about 62Ω ac impedance on the line side and 8Ω on the modulation side. This 8Ω is because my favorite small af amplifier at the moment is the Amperex TAA-300, which has an 8Ω transformerless output impedance.

The bypass across the termination resistor avoids audio loss when modulating. You can use a medium power transistor for the load resistor and modulate it, but your power supplies get more involved then. As shown in Fig. 7 you can take the voltage for the af amplifier right off of the termination resistor because of the isolation provided by the modulation transformer.

Overall System Use

The main body of the amplifier is one thing, which is a good tuned job for telephone work. The input and output circuits are shown as a particular example of one particular system that can be made up using this amplifier. From there on you can figure out (if you're lucky) what system you may need for your particular use.

For instance, you can use a power transistor to key on a single relay or a stepping relay. This transistor will not latch-up like the scr and is thus easier to use in certain cases. On the other hand it must be keyed on all the time, while the scr does not require this. Also the scr can be keyed and you can talk over the circuit. As mentioned, this article is essentially about a low cost 1 – 4000 Hz tuned amplifier.

. . .K1CLL

Critical Supply Items

Cup Cores. Arnold Engineering Co., Marengo, IL or Stackpole Carbon Co., St. Marys St., St. Marys, PA.

SCR. G.E. No. 2N877, Gerber Electronics, 852 Providence Highway, Dedham, MA.

Quad Rectifier Stack. No. 18DB4A-C. International Rectifier Co., 233 Kansas St., El Segundo, CA.

AR-176, AF transformer. Lafayette Radio.

Ralph J. Romig WAØKHV
Box 163
Assaria KS 67416

HEATHKIT GC-1005 DIGITAL READOUT CLOCK

The new Heathkit GC-1005 digital readout clock makes a nice addition to the modern hamshack, since you can use it to indicate 24 hour time, local or GMT, and can synchronize it with WWV quite easily.

However, the readability of the face leaves something to be desired, since there is only a narrow space between the hours and minutes, and another space of the same width between minutes and seconds. That is, an indicated time of 12:34 plus 56 seconds would be displayed: 12 34 56. What is needed, obviously, is some means of separating the hours and minutes from the seconds.

It would be a major project, and probably somewhat doubtful of success, to try to move the display tubes apart any appreciable distance to achieve this condition.

The problem can be solved, or at least improved upon, by attacking it from another direction with a relatively simple modification.

It was done in my shack by mounting a pair of Motorola HEP type P2001 Light Emitting Diodes on a small piece of perforated fiberglass board and wiring them into the low voltage B+ circuit, via a pair of limiting resistors. This assembly was then inserted into the space between the display tubes for the hours and the minutes.

The result was 12:34 56 instead of 12 34 56.

The P2001 LED is rated by the manufacturer at a maximum current of 40 mA, and emits a reddish light at an intensity depend-

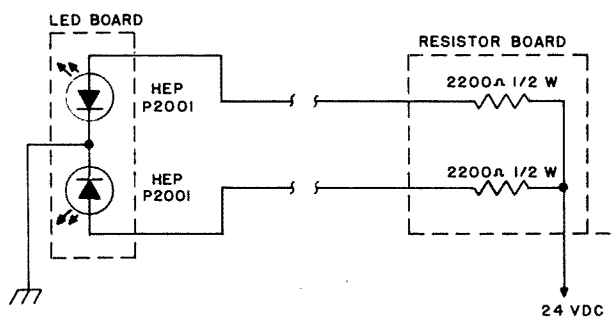
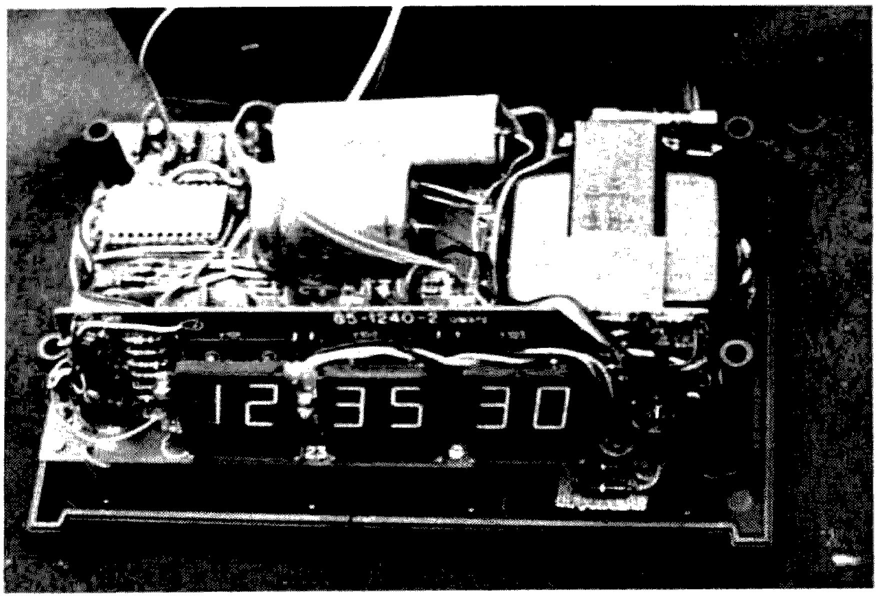


Fig. 1. Schematic used in adding the LED's to the clock.



The LED board is visible between the display tubes for the hours and minutes. The resistor board is visible at the lower right hand corner of the chassis, directly underneath the right side of the seconds display tube.

ing upon the amount of current passing through it.

After experimenting with different values of limiting resistors I finally settled on a current of about 9 mA, flowing through a 2.2 kΩ half watt resistor. This combination yields a light intensity approximately equal to that of the numerals on the clock, although slightly redder in color, and is well within the ratings of the LED.

The LED's are mounted on a piece of perforated fiberglass circuit board approximately 2.5 cm long by 0.75 cm wide, and are offset slightly so they assume a slanted attitude of about the same angle as the numerals. They are mounted vertically about 0.75 cm apart.

The edges of the board were carefully shaved down with a small file until it could be pressed into place between the adjacent edges of the hour and minute display tubes. A drop or two of epoxy glue was used to secure the board, once positioning was satisfactory. Be sure to position the board so the LED's are vertically centered with respect to the numerals.

The cathode leads of the diodes are connected together, and a single wire runs from this point to ground. In addition, a lead runs from each diode's anode to its limiting resistor, both of which are mounted on another piece of circuit board.

Since this is entirely a dc circuit, there is nothing critical about the layout or lead dress. The positive leads can be simply run along the back of the top of the minute and second display tubes and down to the floor of the clock, where they are connected to the resistors.

The resistors are mounted on a piece of circuit board about 2.5 cm by 2.5 cm in size which is secured to the same bolt which holds down one end of the power transformer.

From this point a single lead runs to the source of voltage, about +24V dc, which is tapped by connecting directly to the exposed positive lead of the 1200 μF filter capacitor.

Be sure you connect to the right capacitor, as 230V is present on the other one. If in doubt, use a voltmeter.

The ground lead from the LED board is dressed with the positive leads until they connect to the resistor board, at which point it separates and goes back along the top of the chassis to a ground point. Any exposed ground point can be used, but I grounded the wire by connecting to the negative lead of the filter capacitor, since it is also exposed and convenient to solder to.

In use, the two LED's are lit at all times the clock is in use, and form a double dot between hours and minutes. Their intensity is approximately the same as the numerals, but the color is slightly redder, although not enough to be objectionable.

. . .WAØKHV

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COOK A BETTER CIRCUIT BOARD

...one that fits YOUR parts!

So you saw a swell article in 73 Magazine you would like to build? Of course, being consistent with today's technology, most of these fine articles incorporate a print for an etched circuit board. If you have never made your own board, *read on.* If you have etched your own, you have then probably encountered the following difficulty – *my parts won't fit the author's board #*@%¢$@.* So read on anyway.

Over the past several years I have used the following procedure for altering circuit boards or even creating a completely new layout. It's simple, does not require any special equipment and in many cases designing a new board takes little or no more time than using the one suggested. The end result is a project to be proud of, no bunched up components, no messy lead extensions and the darn thing really looks professional.

Step #1

Having selected a project, assemble all the components before you. Compare your parts with the space allotted in the author's circuit board layout. Most layouts provided are full size and this comparison is simply a matter of laying your parts on the drawing. Assuming there are only minor discrepancies, the original drawing may be altered before the board is coated with the resist paint (airplane dope, fingernail polish, etc.). However, if many of your parts just won't fit, as mine often don't, then design your own board as follows.

Step #2

Take a flat piece of styrofoam, available everywhere nowadays (packing material, hobby or dime stores, or borrow the picnic cooler lid). On the styrofoam lay a plain sheet of paper. Using the schematic of your project, build the circuit by inserting the component leads through the paper and into the styrofoam, in the same manner you would mount parts on the board itself. In most instances the physical placement of the parts and the schematic layout will be very similar. The major advantage of this operation is you may alter the size or shape of the final board to fix a box you already have or fit a particular space requirement.

Figure 1 shows a flat schematic type layout which is not only neat, but should you at some future date wish to modify it, all parts are accessible. Should you wish to miniaturize a circuit, the vertical mounting of parts may be utilized. As you are constructing your circuit, should an area of

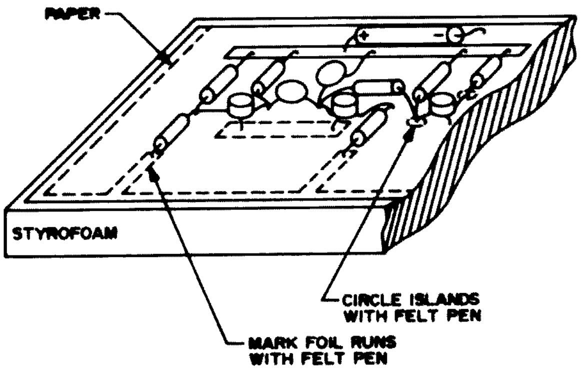

Fig. 1. Typical layout on styrofoam and paper, as described in Step #2 above.

the board become jammed, at this stage it is a simple matter to remove the components involved and reorient them to eliminate the problem.

Step #3

Now that you have simulated the circuit on the paper covered block, use a felt tip pen to circle all the areas where parts are to be soldered. Draw in the connecting foil runs and any islands where leads from parts not mounted on the board are to be connected. Should foil runs have to cross merely break one run and mark it for a jumper to be installed later. An alternate but somewhat more complicated method is to etch the reverse side of the board to supply these crossing foil runs.

Step #4

Remove all the components from the board and, using a hobby knife or razor blade, cut out all the marked islands and foil runs, as though you were making a template. As a matter of fact you *are* making a template. Take the paper template and steam one side over boiling water until it is limp, but not really wet. Immediately lay the template on the blank circuit board stock. Steaming allows it to lay flat and gives some degree of adhesion.

Step #5

Spray a light coating of clear Krylon or similar material on the template covered stock. Common spray enamel may also be used, but any notes you may have made on the template will no longer be legible. Allow 2 or 3 minutes for the paint to set and remove the template. Check over the board for any unwanted spray or runs. If any are noted they are easily removed with the wood portion of a broken pencil. Do *not* attempt to use solvent, as a fine film will remain and incomplete etching will occur.

Once the paint has dried completely, about 30 minutes (or hurry it along with a hair dryer), etch your board with any of the solutions commonly available at mail order houses. I etch in a Pyrex glass dish, borrowed from the kitchen, and heated on the range to about 150°. A combination of heat and gentle rocking will cut the etching time by about 50%. Using surplus board which generally has rather heavy copper, takes about 20 to 30 minutes.

Step #6

Now that your custom board is etched, remove the remaining paint with a Brillo pad and hot water. This clean-up takes only seconds and leaves a nice shiny circuit to go to work on. In the interest of keeping the board's appearance new, before soldering I give the complete board a light coat of clear Krylon spray. No problem soldering will be encountered as a result of this spray and should you desire to mark connections, values, or other identification on the board with a felt pen, these will also be protected.

There is really nothing *sacred* about circuit boards, and no one ever said you must riddle it with holes for component mounting. I generally mount the parts on the foil side, eliminating all the drilling. It looks just as neat and now you don't even need a chassis. Several of my projects are circuit boards laying flat as a base with a front panel made from the same stock (no need for hardware as the panel may be soldered in place) and a wrap-around cover with front panel overhang. Thin aluminum covered with stick-on vinyl makes an attractive and inexpensive cabinet.

Well, that's the story. If you can sweet-talk the XYL into letting you use her hair dryer, range, dish, and nail polish, let's make a board.

. . .WB4MYL

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A VARIABLE Q AUDIO FILTER

The selectivity of modern amateur receivers has become quite good in recent years but there is still room for improvement, especially with the bands as crowded as they are. The following audio filter was designed and built to improve the selectivity of my Heath SB-303, but can be used with any receiver provided it is reasonably stable. The filter's bandwidth at -6 dB, for a center frequency of 1 kHz, is variable from approximately 400 Hz to less than 50 Hz. The entire unit is solid state, requires no bulky L-C components, and is built as an external receiver accessory. Cost of the project using all new components is about $35.

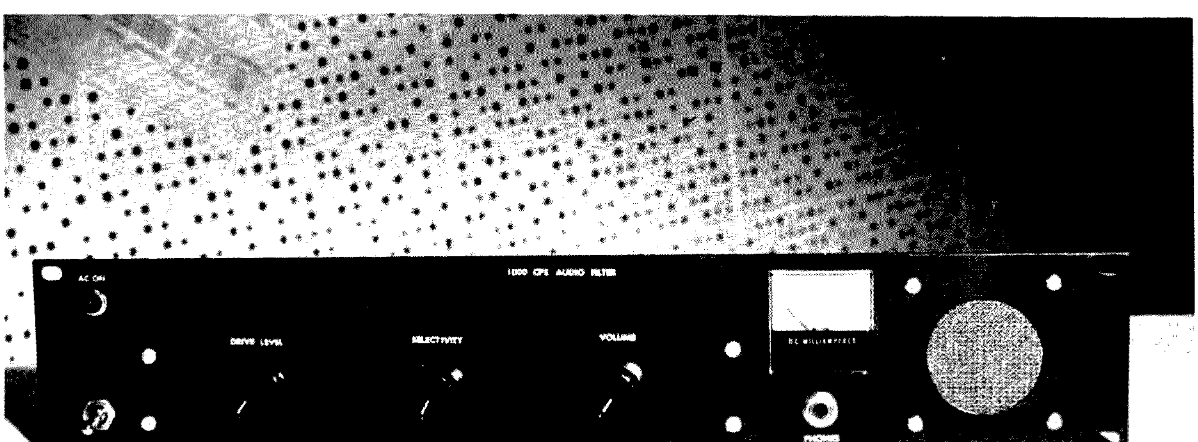
The Circuit

The filter is a tuned amplifier using inverse feedback. Audio from the receiver enters through emitter follower Q1 and is passed on to amplifier Q3, which inverts the signal's phase. Part of this inverted signal is then fed back to twin-T network, R1, R2, R3 and C1, C2, C3. The particular network presents high impedance to ground at all frequencies except its resonant frequency, similar to a series tuned L-C circuit. The unattenuated signal next enters emitter follower Q2, and without further phase shift, is added to the uninverted input at the base of Q3. Since there are now two out-of-phase signals feeding amplifier Q3, its net output is severely reduced. The degree of cancellation, therefore the selectivity, can be controlled by the setting of R4, which determines the amount of inverted signal reaching the base of Q3. This process occurs at all frequencies except the chosen resonant frequency. At resonance no inverted signal will be passed by the twin-T network, allowing the original input signal to be amplified by Q3. The filtered output is then boosted by amplifiers Q4 and Q5 to drive a small speaker or phones.

Since it is possible to overdrive Q3, it is necessary to have some way to know when the input level is correct. This is accomplished by sampling a portion of Q3's output with meter amplifier Q6 and rectifying it to drive a 1 mA meter. The meter is calibrated by the setting of R5 so that 4V p-p at the collector of Q3 reads 0.4 on the meter. This is just below the overdrive point of the tuned amplifier.

Construction Notes

Most of the circuit (excluding transformers) was constructed on Vectorboard using press-fit terminals, but could be built on a PC board with the accompanying reduction



The filter can be assembled for rack mounting as shown or in its own box as a receiver accessory.

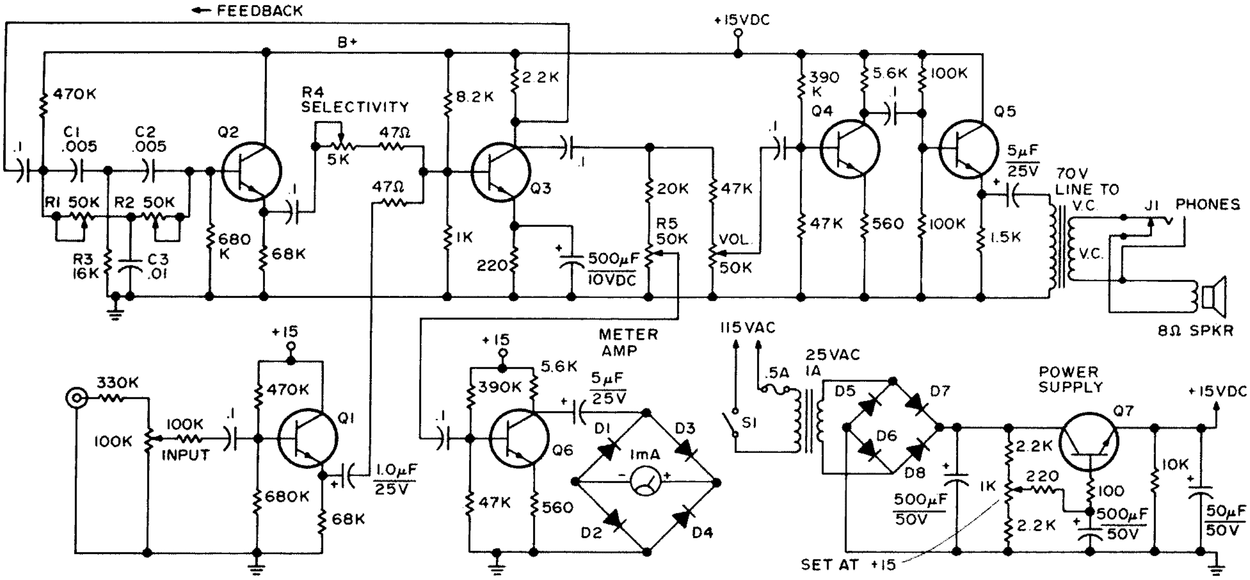
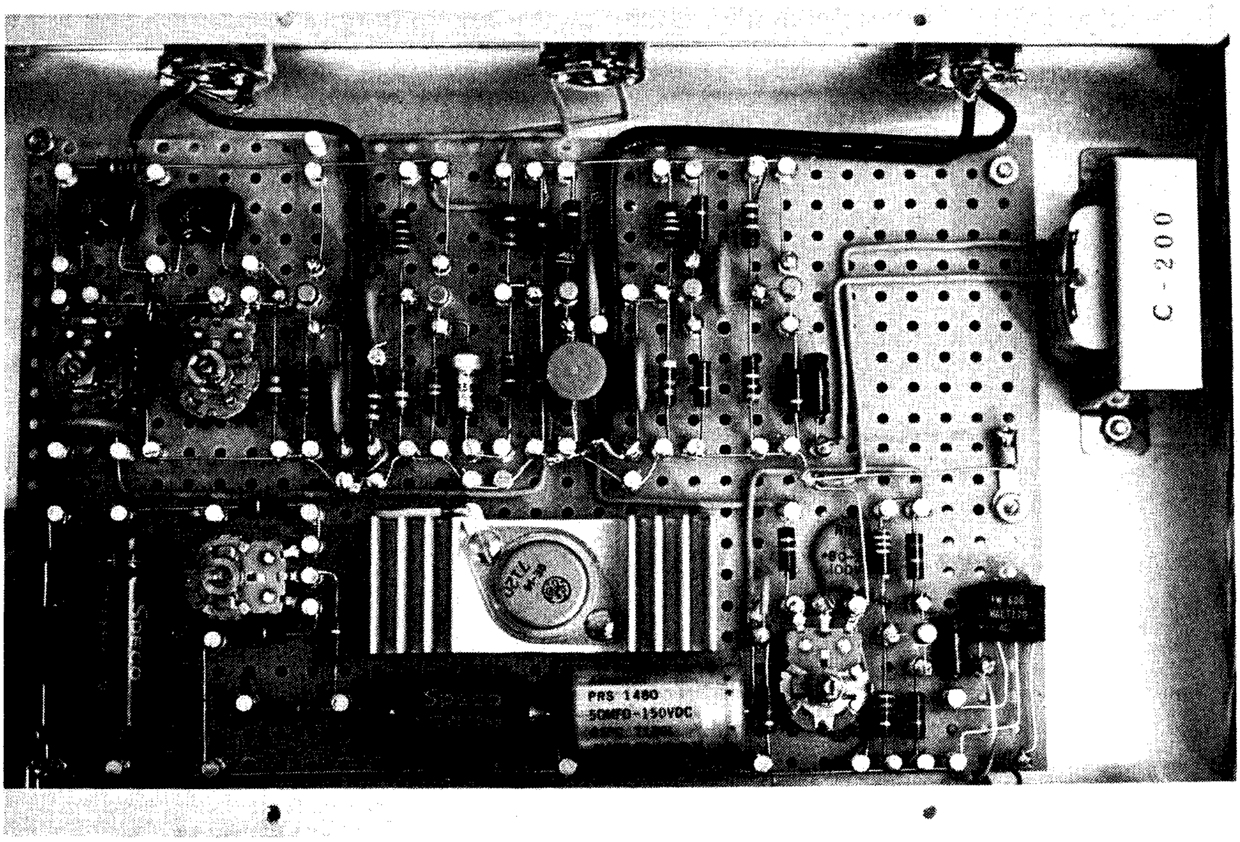


Fig. 1. Schematic of the Variable Q Audio Filter. Although it is designed around a center frequency of 1000 Hz, information is given in the text to modify the frequency to suit any need. Q1 through Q6 are GE-20 transistors, and Q7 may be a GE-14 or GE-28.

in size. The circuit board and output transformer were housed in a 7 x 11 x 2 inch chassis, which was too small to accommodate the power transformer too, so it was mounted outboard on the rear of the chassis. The front panel is a rack panel, which turned out to be just wide enough to mount all the controls, meter, and a small speaker. The 1500Ω output of the amplifier was matched to the speaker by using a 70V line transformer connected at the 5W tap. The heat sink for the regulator transistor in the power



This view shows the assembly on a piece of Vectorbaord. The size can be reduced considerably with miniature components and denser packaging.

supply was later found to be unnecessary. The use of poorly matched capacitors in the twin-T network willl result in a low-Q filter. Capacitors should be 1% silver mica for C1, C2, C3, or they should be matched on a bridge. Do not attempt to substitute ceramic capacitors.

Calibration

A scope is best for making final adjustments but a VTVM will do. Disconnect the power supply output and switch on the ac. Set the output voltage at +15V dc. Ripple should be less than 6 mV p-p. Reconnect the power supply and disconnect the selectivity control. Feed in a 1 kHz tone from the receiver or a generator and adjust the input level control for 4V p-p output at the collector of Q3. Adjust the meter amplifier to read 0.4 mA on the meter. Preset the two pots in the arms of the twin-T to 32K. Reconnect the selectivity control, set it at 12 o'clock, and alternately trim the pots in the twin-T for a peak at or near 1 kHz. In my filter the peak occurred at 950 Hz as measured on a GR 1191 frequency counter. Advance the selectivity and repeak the twin-T, retuning the receiver or generator to keep on the nose of the filter's selectivity curve. Turning the selectivity control up all

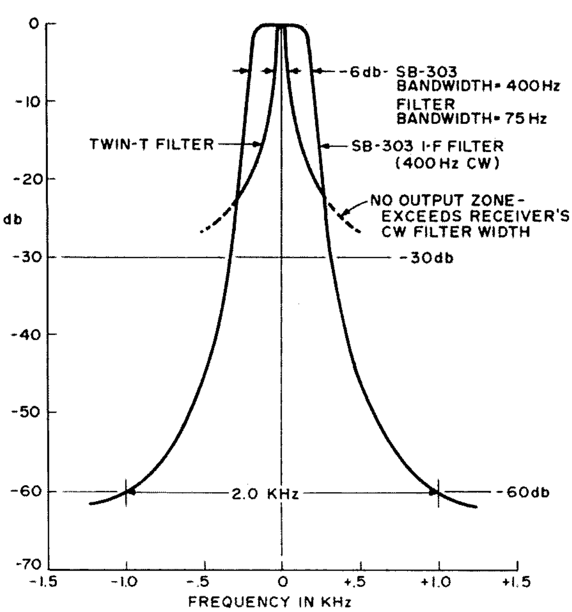


Fig. 2. Graph showing the filter's effect on the bandwidth of a receiver with an internal 400 Hz filter.

the way may result in a regenerative howl due to excessive feedback in the circuit itself, even with no input signal. This is normal, and the selectivity is too narrow to be useful anyhow (40 Hz or less). Under the right conditions the circuit will narrow down to a ridiculous 11 Hz at -6 dB.

When tuning the twin-T, you will probably find that the circuit will peak almost anywhere near 1 kHz, which may or may not be the point of best selectivity. Therefore, rock the receiver or generator dial as you tune for a peak in the output. There will be one frequency which gives a significantly larger output than any other. This frequency is the one to adjust to.

Operation

Tune in a signal in a noisy, crowded portion of a CW band without using the filter. Set the filter's volume at 3 o'clock and the selectivity at about 12 o'clock. Now turn up the input level on the filter and retune the receiver until the desired signal suddenly peaks up in the filter and reads 0.4 mA on the meter. Set the selectivity as desired, 100 Hz (2 o'clock) being a good starting place. While peaked on a signal, switch off the receiver's speaker and listen on the filter instead. Tuning is quite sharp, peaking the desired station and severely attenuating all other noise and adjacent QRM. To resume normal operation, reduce the filter's volume setting and switch the regular station speaker back on. This system will allow for switching from "normal" to "sharp" selectivity with a minimum of effort.

Some operators may prefer a different frequency of filter responses, such as 900 Hz instead of 1 kHz. Or, perhaps filters for two different frequencies are needed, as in RTTY conversion. If this is the case, the values of C1, C2, and C3 must be altered using the following method.

Let R3 equal 16K. R1 and R2 are then twice this value. C3 is calculated so that at the frequency of resonance, its reactance equals R3, or 16 KΩ.

$C = 1/2\pi fXc$ where $Xc = 16\ K\Omega$, or more simply $C = 1/0.1f$ where C is in microfarads and f is in Hz. C1 and C2 are each half of the value of C3.

. . .WA4DCN

ANOTHER BLOWN FUSE INDICATOR FOR LOW VOLTAGE

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In the March '72 issue of *73,* WØEDO described a method of using incandescent lamps to detect blown fuses in low-voltage equipment. Light emitting diodes can do the same thing, using the circuit shown. The main advantages are small size, very low indicator current after the fuse blows, and high reliability. The disadvantage is cost.

Since LED's haven't been heard from very much in ham gear, a few words about their characteristics are in order before looking at the circuitry.

Like rectifying diodes, LED's have a nearly constant forward voltage drop across a wide range of currents (typically about 1.2V). This means that an external resistor is necessary to control the current when operating from a constant voltage supply. The safe reverse voltage is generally only about 3V. Light is emitted only when forward current is applied, so polarity must be observed. The negative terminal is usually marked with a wide lead, a color dot, or a notch in the rim of the case. I've found that 3 mA will produce just about enough light to see when looking closely at the LED, while 20 mA will make a bright enough glow to draw attention in a well-lit room. The maximum safe current is in the range of 50–100 mA. The operating current should be chosen somewhere within these limits, consistent with the needs of the situation and the maximum safe current under blown fuse conditions. No socket is used.

The voltage across the series resistor is the supply voltage less the LED forward drop, so the resistance is $R = (E - 1.2V)/I$ and the power dissipation is $P = I^2R$. In an ac circuit, a capacitor or inductor may be substituted, with a reactance equal to the resistance given above.

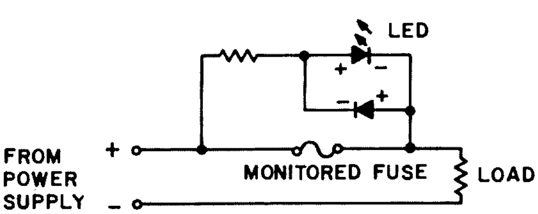

Fig. 1. Blown fuse indicator.

The reversed diode across the LED is needed in an ac circuit to short it during the reverse half of the cycle and prevent reverse voltage from appearing across the LED. While it isn't necessary for dc, it does serve as insurance in case the circuit is initially installed backwards. In the rare case of a dc supply of unpredictable or changeable polarity, it would be possible to use another LED for the protective diode, so that each would protect the other and one would always light, or else place a single LED in a 4-diode rectifying bridge.

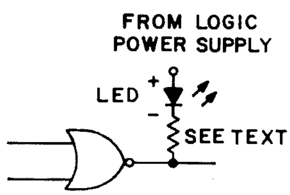

Fig. 2. Logic readout.

Most industrial electronics dealers carry such LED's as the Monsanto MV50 or its panel-mounting equivalent the MV5020. These are priced in the 75¢ to $1.50 range. Almost any inexpensive red-emitting LED should work equally well. As for the reverse protection diode, practically anything should be satisfactory, though a small silicon diode would have the smallest leakage. I prefer the 1N4148 because it's available for as little as 8¢.

Another use for LED's worth mentioning is readout from logic circuits. They will run directly from a logic gate and need no special driver or power supply.

. . .K6HKB/1

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BUILDING WITH TEN-TEC MODULES A 40/20 METER QRP CW TRANSCEIVER

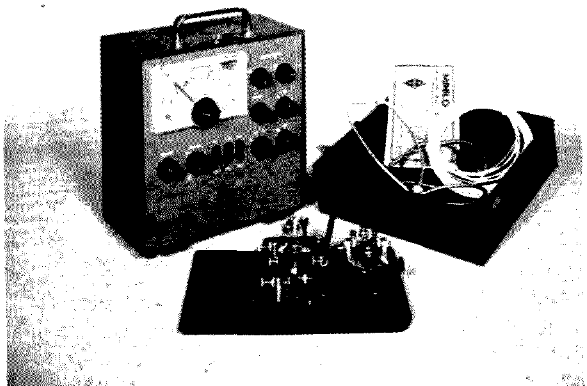
What's this – another QRP transceiver? The magazines are full of them these days. What's the sudden interest in flea-power operation?

QRP has indeed made a strong comeback. And there are good reasons. Simple but efficient transistor circuits make possible compact rigs that appeal to the traveler and camper. Stable vfo's are replacing those old-time rockbound peanut whistles we used a while back. (Remember the 3V4 and a handful of crystals? For every rock you had, there were a dozen guys on the same frequency, each running a gallon!)

And there is another reason. More and more fellows are finding that you *can* communicate with only a few watts. And what's more, it's fun and challenging. When the band is open, and you get a 589 from that OH in Helsinki, and your input power is only 2W, well, what more is there to say?

But QRP isn't for everyone, and before I lead you astray, it's only fair to point out that the calls-vs-contact ratio can be pretty low, especially during the crowded evening hours. It takes skill, special techniques and patience to operate low power successfully. So, if you are just getting started in ham radio, or if your frustration level is low, perhaps you had best leave QRP alone for a while.

Ten-Tec Corporation of Sevierville, Tennessee, offers a line of solid-state modules



Complete QRP station in a box. Key, headphones, antenna and logbook fit into deep cover on author's transceiver. Two lantern batteries fit alongside loudspeaker, under bottom panel.

that lets you put together QRP CW transceivers covering 80 through 15 meters. You can buy their MR1 kit with which you can make a 2W rig covering 80, 40, 20 or 15 meters. Or you can buy their basic modules and build a 5 watter for 40 and 20 meters. Either transceiver can be powered from 12V lantern, motorcycle or auto batteries. Of course, you can also buy these rigs already built and in a handsome cabinet, but if you like to tailor your rigs to your own particular style, the modules are the way to go.

For my camping trips I chose to build a 5W transceiver to cover 40 and 20 meters, but the general construction tips and accessories described here can be applied to the other rigs possible using the Ten-Tec modules. My rig features one-knob bandswitching, CW sidetone, a built-in antenna tuner and swr bridge (a must for those random length antennas), dial lamps for nighttime operation and a loudspeaker. In addition, I selected a cabinet with enough room to house the batteries, headphones, key, logbook, scratch pad and other odds and ends, truly giving me a "station in a box."

Circuit Description

A block diagram of the transceiver is shown in Fig. 1. The receiver utilizes the synchrodyne principle, also known as direct conversion. A bfo, operating at the receiving frequency, beats with the incoming signal in a product detector. The resultant frequency is an audio signal which is processed by a high-gain audio amplifier to drive the loudspeaker or headphones. A filter in the

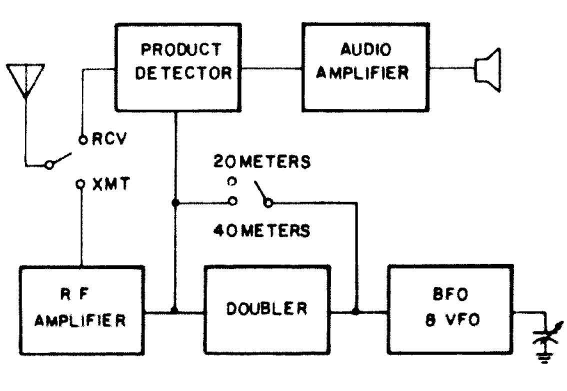


Fig. 1. Block diagram

PARTS LIST

Transceiver

MODULES: (Order from Ten-Tec, Inc., Sevierville TN 37862)
VO1 Oscillator
MX1 Mixer
AA1 Audio Amplifier
AC6 20 meter double & sidetone oscillator
TX2 40/20 meter transmitter

T1 – 1000 ohm to 8 ohm miniature output transformer (Radio Shack No.1380)
R1 – 220 ohm ½W
R2 – 3300 ohm ½W
R3 – 25,000 volume control with on/off switch (Radio Shack No.094)
R4 – 6,800 ohm ½W
C1, C3, C4 – 365 pF variable (Radio Shack No.1344, Lafayette No.11034)
C2 – 560 pF mica
C5 – .22 µF 35V
C6, C7 – .1 µF 35V
C8 – 82 pF mica
Speaker – 2" diameter 8 ohm (Radio Shack No.245)
Dial – Radio Shack No.388 (5"), Lafayette No.25660 (4¼")
Cabinet – Glenwood Sales, 594 Hague St., Rochester NY 14609
S1 – SPST (part of R3)
S2 – Five pole, two position rotary (Mallory 3263J or 4M2323 usable)
S3, S4 – DPDT rocker switches (Radio Shack No.030 kit of two)
LMP1, LMP2 – 6.3V panel lamps, No.47

output of the product detector establishes the selectivity of the receiver, which is around 2 kHz. The sensitivity of this simple receiver is surprisingly good, and it appears to be comparable in performance to medium-priced communications receivers.

In the transmitter portion, the bfo functions as a vfo, and you transmit on the same frequency you receive on. A buffer stage isolates the vfo from the driver and power amplifier. (For 20-meter operation, a doubler circuit is switched in between the buffer and the driver.) The output comprises a push-pull power amplifier feeding a pi network designed to work into 50–75Ω loads.

The antenna tuner and swr bridge circuits were taken from various articles in recent magazines. The tuner comprises a tapped toroid coil and a single 365 pF variable capacitor. The swr bridge also uses a toroid coil to boost the sensitivity to provide adequate meter deflection at these low power levels.

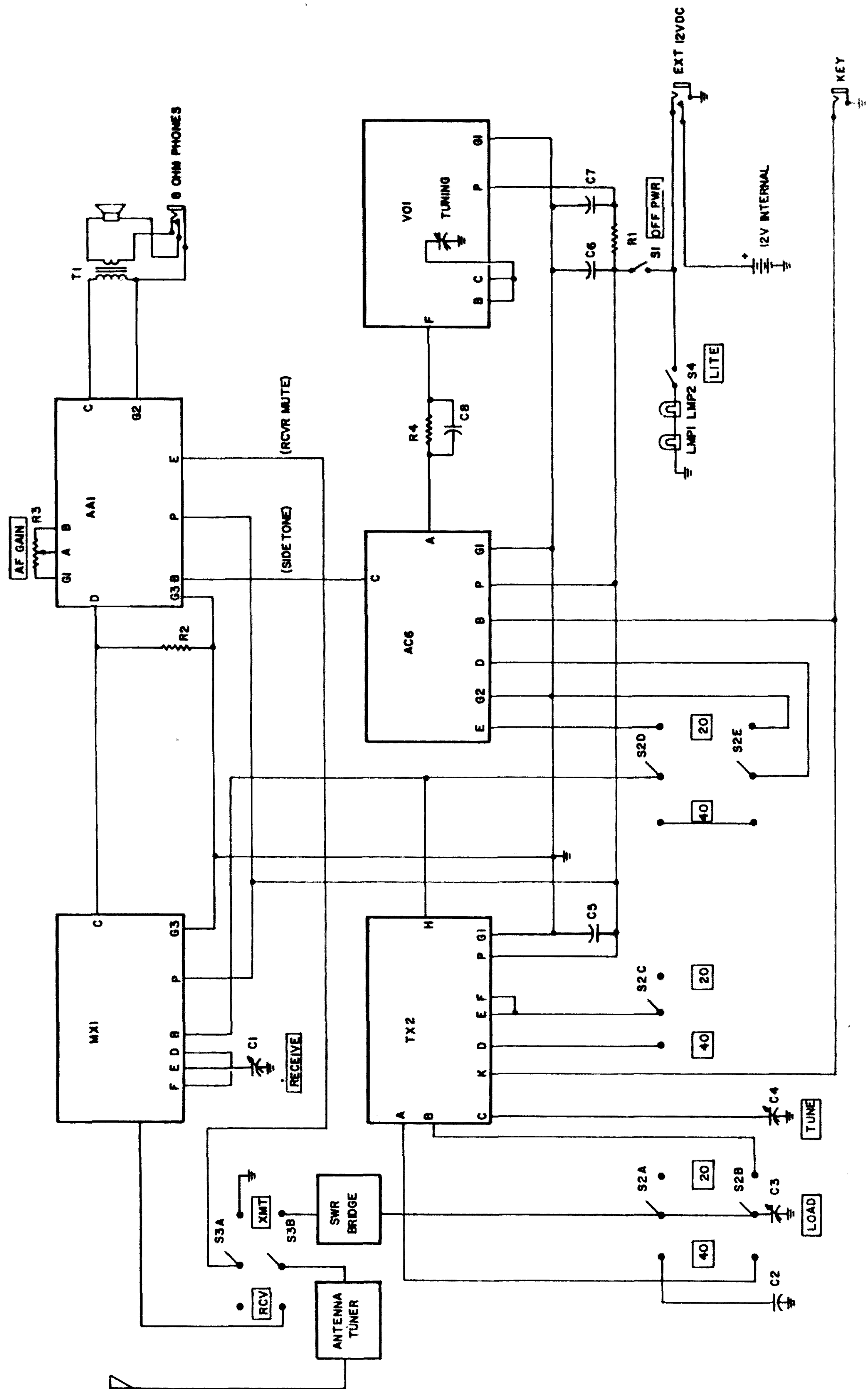


Fig. 2. Wiring diagram for transceiver.

References to articles containing details of the synchrodyne principle, basic Ten-Tec transceivers and the other circuits are provided at the end of the article.

Construction

Connections are made to solder pins on the boards, which are coded for easy identification. The boards come packed with spacers for mounting, aligning tools (where required) and data sheets giving the schematic of the board and signal specifications.

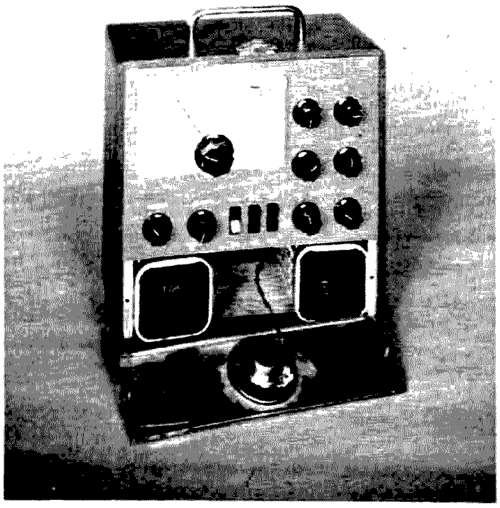
It is doubtful that you will want to duplicate my cabinet layout, so I won't go into the nitty-gritty details of chassis dimensions, etc. – the photos give you a good idea of my particular construction. Placement of boards with respect to one another is not critical, but common sense should be used to prevent unnecessarily long leads, especially from the boards to the bandswitch. The vfo board *must* be mounted as rigidly as possible for frequency stability.

The variable capacitor that comes mounted on the VO1 board opens counterclockwise. If you couple it to a vernier dial of the type shown in the photos, the lower frequencies will be at the right hand side, and the higher frequencies at the left, contrary to normal practice. If you want the frequencies to be in keeping with the "logical" rotation of the knob, this can be easily corrected by substituting a 365 pF or 405 pF capacitor that opens clockwise.

A wire is wrapped around the MOSFET leads on the mixer board for protection against voltage spikes which may occur during construction. Be sure you leave this wire in place while you construct the rig. Remove the wire prior to operation, after all soldering is complete.

In retrospect I found the dial lamps to be a nonessential addition. However, should you decide to use lights, keep in mind they draw more current than does the receiver! For this reason I included an on/off switch just for the lights, to keep from depleting the lantern batteries.

I had never wound toroid coils before, so it was an interesting learning experience making the coils for the antenna tuner and the swr bridge. It's really very simple. Take a short length of wire of the size you will be using for the coil, and wrap one turn around the core. Unwind the wire and flatten it out, then measure its length. Multiply the length by the number of turns, and add a few inches for safety. Place the toroid core in the center of this length of wire and begin winding the turns, carefully forming each turn around the core snugly by hand. When you have wrapped one-half the number of turns, begin with the other end of the wire. Be careful not to kink the wire. This technique reduces the number of twists and



Two front views of the transceiver, one showing battery compartment behind loudspeaker panel. Note how panel space is conserved by placing SWR meter within dial assembly.

turns on the wire, and makes the overall job easier. In the case of the antenna tuner, taps are made to the coil using stiff copper wire which is soldered to the 11-position rotary switch. This provides the mechanical mounting for the coil.

The parts for the swr bridge should be laid out as symmetrically as possible for accurate results. The toroid transformer provides more than sufficient drive for the meter, which in my rig is a 500 μA movement. Once the bridge is built and wired in place, it must be nulled; this is covered later on in the article.

Testing

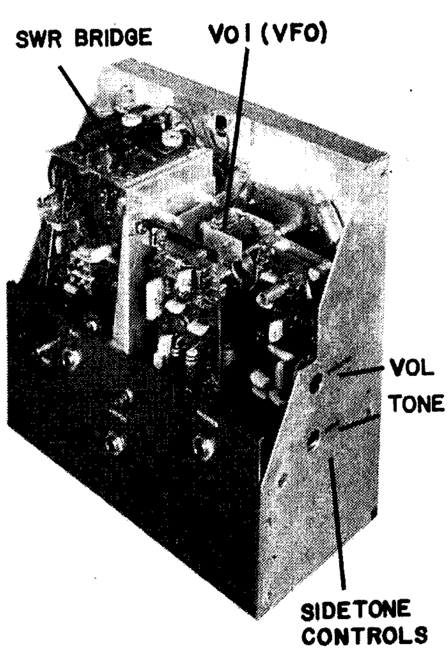
Once wiring is complete, remove the shorting wire from around the MOSFET on the mixer board. Connect the battery and antenna and place the bandswitch to 40 meters. With the mode switch in RECEIVE, turn the unit on and peak the receive control for best reception. Switch to 20 meter operation and repeak the receive control; you will notice it is a bit touchy on this band, but you should have no problem in getting good reception on 20 meters.

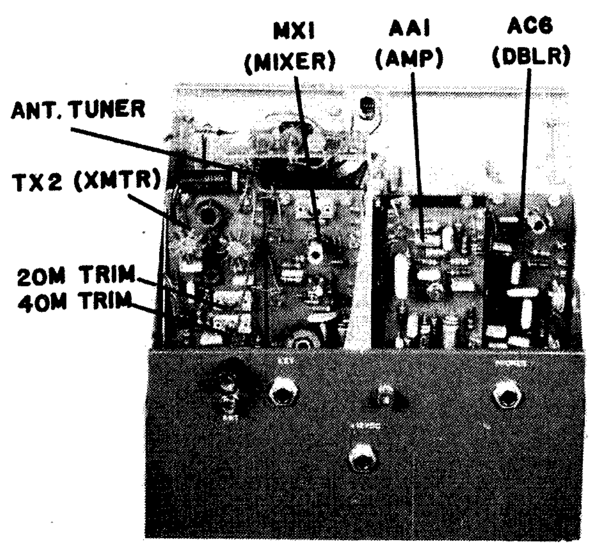
Since you are probably itching to see whether the transmitter section works, connect a 5 watt non-inductive load to the antenna to serve as a dummy antenna and, with the swr meter control at mid range, close the key and adjust the tune and load controls for an indication of rf on the meter. If you get an indication, fine and dandy. Leave the transmitter for now, and let's calibrate the little fellow.

Calibration

You can use a communications receiver for calibration – one whose calibration you can trust – or a signal generator. The following calibration procedure is based on using a receiver.

Check that the tuning capacitor on the vfo board is fully meshed when the vernier dial pointer is at zero. Place the transceiver bandwitch to 40 meters, then set the calibrating receiver's dial to exactly 7.0 MHz and turn on the transceiver. Using the plastic alignment tool that came with the vfo board, carefully place it in the metal can on the board, down past the first slug (there are two slugs – the top one is for 80-meter use). Slowly adjust the bottom slug until you hear the bfo signal in the communications receiver's speaker. You will be amazed at how strong the radiation of this little oscillator is! Adjust the slug for zero beat and mark the dial face with a pencil.





Two views showing placement of Ten-Tec modules in the author's unit. Thumbnut above external 12 V jack is ground terminal

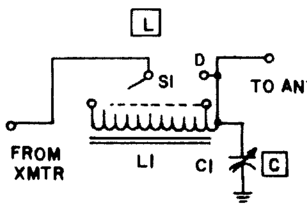


Fig. 3. Schematic of antenna tuner.

PARTS LIST
Antenna Tuner

L1 — 30 turns No.20 enameled wire over Amidon T-130-2 toroid core (Amidon Associates, 12033 Otsego St., N. Hollywood CA 91607). Taps every 3 or 4 turns. Space turns evenly.
S1 — 11 position rotary switch (Mallory 4M21111)
C1 — 365 pF variable (Radio Shack No.1344, Lafayette No.11034)

Now, by moving the calibrating receiver's dial, a division at a time (the increment is up to you – I used every 10 kHz), and positioning the transceiver dial until you get a zero beat in the calibrating receiver, you can mark the transceiver dial from 7.0 to 7.3 MHz. Repeat this operation for the 20-meter band, keeping in mind that the frequency spread is one-half of the 40-meter display (you're doubling the frequency, remember?). If you are lazy, you can transfer the calibration marks from the 40-meter dial to the 20-meter dial, keeping in mind that 7.01 will be 14.02 and so on.

Tuneup and Adjustment

With the dummy load in place, switch to 20 meters and tune the transmitter for maximum rf output using the TUNE and LOAD controls (make sure the antenna tuner is out of the circuit). Don't keep the key down for prolonged periods of time; just enough to get a reading. Adjust the trimmer capacitor nearest to the output transistors on the transmitter board (TX2) for maximum rf output on the meter, maintaining resonance with the TUNE and LOAD controls. Switch to 40 meters and adjust the TUNE and LOAD controls for maximum rf output, then adjust the trimmer on TX2 farthest from the output transistors for maximum rf.

Switch back to 20 meters and adjust the slug in the coil on the AC6 doubler board for maximum rf output. For CW operation, peak the coil with the transceiver set at 14.050 MHz; the setting will hold for the CW portion of the band.

To null the swr bridge, use the dummy load, and tune the transmitter. Adjust the bridge for full-scale deflection in FWD. Switch to REF and adjust the trimmer capacitor at the input end of the bridge (C1) for a null on the meter. Temporarily unsolder the input and output to the bridge and reverse them, then null C2, with the switch in FWD. (Don't lose any sleep if you can't get a perfect null; remember you are looking for relative front-to-back readings.)

Power Supplies

The transceiver requires a 12V power supply. Current drain in receive is about 30 mA, and in transmit, can run 480 mA. You can use a pair of 6V lantern batteries in

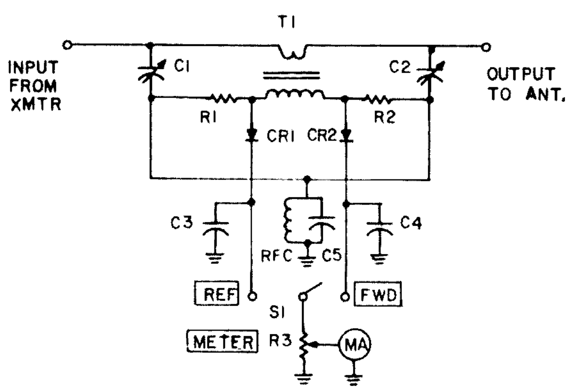


Fig. 4. Schematic of SWR bridge.

PARTS LIST
SWR Bridge

T1 — 60 turns No.30 enameled wire over Amidon T-68-2 toroid core. Close wind the turns. Primary is two turns No.22 or 24 hookup wire wound over center of secondary.
C1 C2 — 1.5–7 pF ceramic trimmer (Lafayette No.68386 mica usable)
R1, R2 — 120 ohm ½W
CR1, CR2 — 1N34A or equivalent (Radio Shack No.821 for pack of 10; select two that match the closest).
C3, C4 — .005 μF disc type
C5 — 330 pF ceramic or silver mica
RFC - 1 mH choke
S1 — SPDT (Use DPDT Radio Shack rocker; No.030 for kit of two)
R3 — 25,000 ohm linear taper control (Radio Shack No.094)
Meter — 50 μA to 1 mA movement (Lafayette 500 μA No. 50361 a good size)

Motorcycle batteries make good portable powe[r] *supplies. Two 6 volt, 2 amp/hour units such as thi*[s] *can fit into case along with a small battery charger Care must be taken to keep batteries upright t*[o] *prevent acid spillage.*

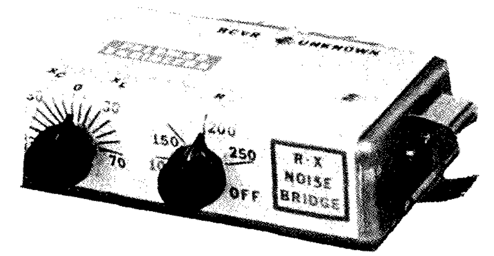
series or a 12V lantern battery and get pretty good performance from them. But it is highly recommended that you use a power source that presents a "stiffer" load to the rig, such as an automobile battery or motorcycle storage battery. These sources will go a long way in preventing unwanted deviations in supply voltage and the possibility of chirpy signals. You can buy two 6V 2 amp/hr batteries for a small Honda motorbike from Sears or Montgomery-Ward for around $4 each. The batteries are small enough to fit into the cover of the cabinet I used, along with a small charger.

Antennas

The built-in antenna tuner will let you load a variety of radiators. I often use just a 65 ft long piece of wire, tying one end to a length of nylon builder's twine and a rock, and tossing it into a tree. By tuning the transmitter, watching the FWD and REF readings, and adjusting the L and C, a bit at a time, you can usually get a good match and make worthwhile contacts. But you may find the rig is "hot" with rf, and touching the case may detune the rig!

A better solution to the antenna problem is to use a simple trap dipole covering 40 and 20 meters. The improvement over the long wire justifies the extra work involved in setting up such an antenna. Of course you could also use a vertical, such as the 14AVQ, as long as you use a good ground rod or make a set of radials.

R-X NOISE BRIDGE



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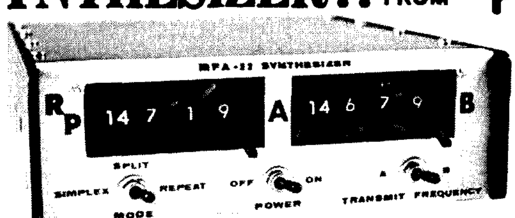

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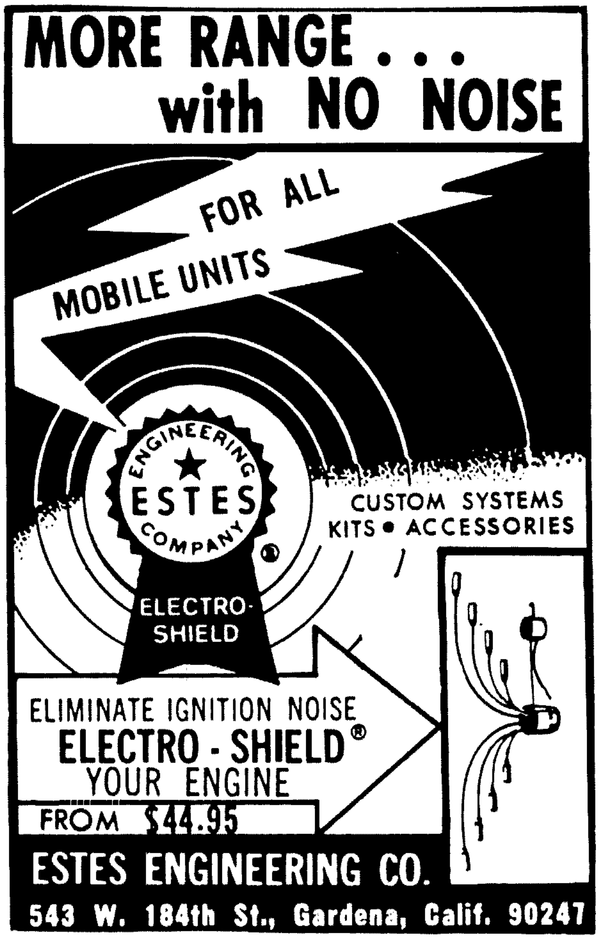

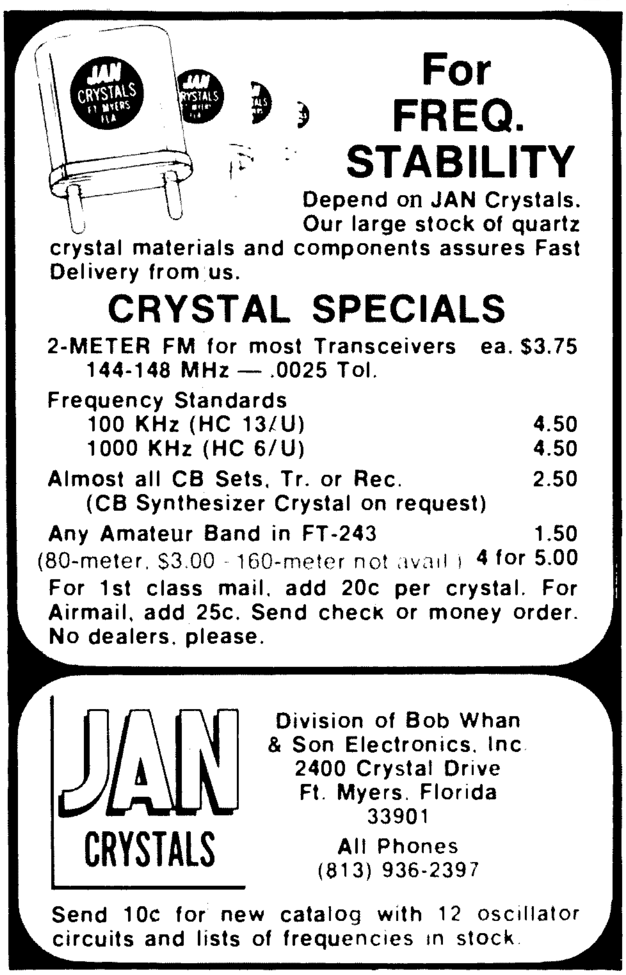

Operating Tips

You will learn very quickly that it takes a bit of patience and a slightly different operating technique to be a successful QRP man. Experience has proven it's better to answer a CQ than to call one yourself. You will usually do better when the band isn't too crowded, and before the noise level gets up. My best operating has been early morning through late afternoons. And with so many transceivers on the air these days, if you tune to the high-frequency side of the other fellow's signal, you will establish the correct frequency offset so he will be able to hear you without having to retune his receiver.

On 20 meters, you may hear foreign broadcast stations all over the band, regardless of the position of the main tuning dial. This is due to overloading of the simple receiver front end, and can be reduced bv carefully peaking the RECEIVE control. If they still leak through, and adjusting the antenna tuner doesn't attenuate them into the noise level, you may need a trap in the antenna lead to the receiver. I've been able to peak up the controls so that while the BCI is still there, it is far enough down in dB so as not to bother my operation.

One last comment. Please use tact when you receive better signal reports from fellows running 100 times the power you are, than you give them. They'll most likely call you a liar when you repeat for the third time that you are only running a few watts input. It's just that they haven't learned yet that you can get out with your little flea power job almost as well as they can!

A special thanks is in order to Mr. Jack Birchfield of Ten-Tec, Inc., for his invaluable technical assistance, and to Mr. Court Packer for his photography.

. . .WB2WYO

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Toroid Coils "The Whole of the Doughnut", June 1967 *73* (Klein)

Bob Barrington W6JDD
1087 Hewitt Drive
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You can't do this blindfolded, any more than you could expect to repair a complicated piece of electronic gear with a wad of chewing gum. But the kind of tools you need are not that difficult to come by . . . and you may have some of them already on hand in the shack: a good output meter (rf bridge or wattmeter); a monitor scope; and a pair of good ears, preferably belonging to an unprejudiced friend in the amateur fraternity. Better yet, instead of somebody else's ears, why not a tape recorder? You don't have to argue with it . . . it is up to you to accept or reject the recorder's completely unbiased judgment!

Where do you start? Comb through the past two or three years of articles in the various ham publications if you like. But if you'd prefer to make it a little easier on yourself, and inexpensive, play around with the circuit shown below. It has worked wonders with Swan's, SBE's and many other transceivers.

The basic circuit is pretty simple and straightforward: the correct use and adjustment of it, not necessarily so. Here are the guide rules: when the unit is properly aiding your average talk-power level, an rf bridge on forward power or a wattmeter will clearly "hang up," like delayed AVC action on the "S" meter reading of a strongly received signal. Your "Christmas tree" pattern on a scope will demonstrate the difference, too. And a brother ham can confirm this on his "S" meter at a distant receiving point.

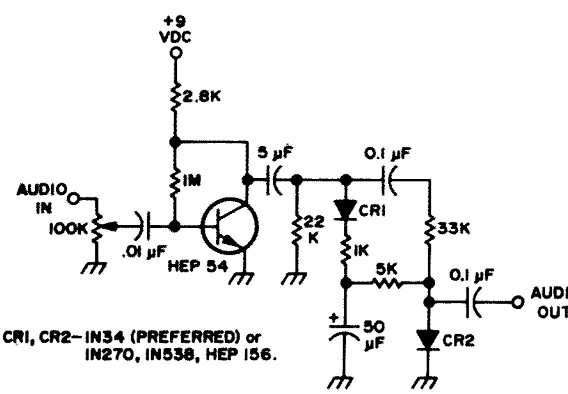

Fig. 1. W6JDD's audio preamp compressor.

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You can control the degree of compression to some extent by setting the mike level into the circuit through adjustment of the 100K input potentiometer. Then compensate for the overall level by readjustment of your exciter's own mike level control. The outboard circuitry ends up with passive diode compression. The number of dB's of compression will vary here if you experiment with various types of diodes. Since the time constant is controlled by the 50 μF capacitor and the 5K resistor, some experimentation here too will provide some different and measurable results in the output.

Regardless of what the output meter says, the acid test is how it sounds. Distorted compression is worse than no compression at all! Here's where your friendly tape recorder is better than your friendly "friend's" ears. If you hanker for some of that old D-104 penetrating quality with high talk-power punch for mowing down the DX, you can get it. Depending on your mike and your voice, experiment with input coupling capacitors ranging from .001 to .1 μF. Run a test through a tape recorder . . . you'll know when it's right. The .01 is just right for my voice; it may not be for yours.

This type of circuit will perform with almost any kind of an audio transistor at voltages ranging from two penlight cells to a standard 9V transistor battery. Germanium diodes are preferred to silicon diodes due to operating reference levels.

One final word of caution. Always shield such a circuit well in a suitable minibox. An rf choke and small bypass filter is desirable in the hot input mike lead. If you run a linear keep an eye on a scope for "fuzzing" of the pattern as an indicator of rf leakage into the unit. Circuits like this lend themselves ideally to perfboard layout and construction.

If you possibly can, play with matching the critical components to your custom tailored requirements, utilizing the tape recorder as the judge. *Then* put it on the air . . . and better yet . . . *don't* use a linear. That will prove to you (if you have done your homework right) that you really have gotten something – almost – for nothing!

. . .W6JDD

Gerald Bay W1GQG
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Stamford CT 06906

AN INTEGRATED CIRCUIT SWL RECEIVER

Many hams received their introduction to radio through listening to the international short wave listening (SWL) bands. The thrill of sitting in your own home listening to a broadcast by a station in a foreign land was only exceeded by the realization that one could become a ham and conduct an international two-way conversation.

The trends to SSB and all ham band transceivers increased the effectiveness and pleasure of hamming. However, the capability to browse the international broadcast bands is often missed. Building a simple converter ahead of a SSB receiver is not sufficient since the broadcast stations use AM.

In addition to the construction of a receiver converting the SWL bands, I wanted to build a receiver using integrated circuits to the maximum extent possible. Design objectives included: coverage of the 9, 11, and 15 MHz bands plus WWV at 10 and 15 MHz; Sufficient selectivity to adequately separate signals on the often crowded bands; good sensitivity without the use of an external antenna; reasonable fidelity and stability; and simplicity and low cost.

The receiver described in the following sections met these objectives and has provided many hours of pleasant listening to stations in foreign lands.

The Integrated Circuit

Upon review of the numerous analog of ICs available, the Amperex TAD-100 was selected. This device provides all the active components needed for a complete AM broadcast receiver except for the complementary pair audio output transistors. The internal oscillator is only operable to about 3 MHz but the mixer gives good results to 27 MHz when driven by an external oscillator.

The circuit of the TAD-100 is shown in Fig. 1. Q1 and Q2 comprise a long-tailed-pair mixer and Q3 is a dc coupled oscillator. In the SWL receiver, Q3 is prevented from oscillating and the external oscillator injection is applied to the emitters of Q1 and Q2. An external ceramic filter provides selectivity between the mixer and i-f amplifier.

A three stage i-f, consisting of Q4, Q5, and Q6 provides amplification. A dc feedback circuit (pins 10 and 11 are dc connected) aids stability. Q7 is the AM detector and Q8 and Q9 form a long-tailed-pair audio preamplifier section. A Darlington circuit, Q10 and Q11, drive a 2N4107 complemen-

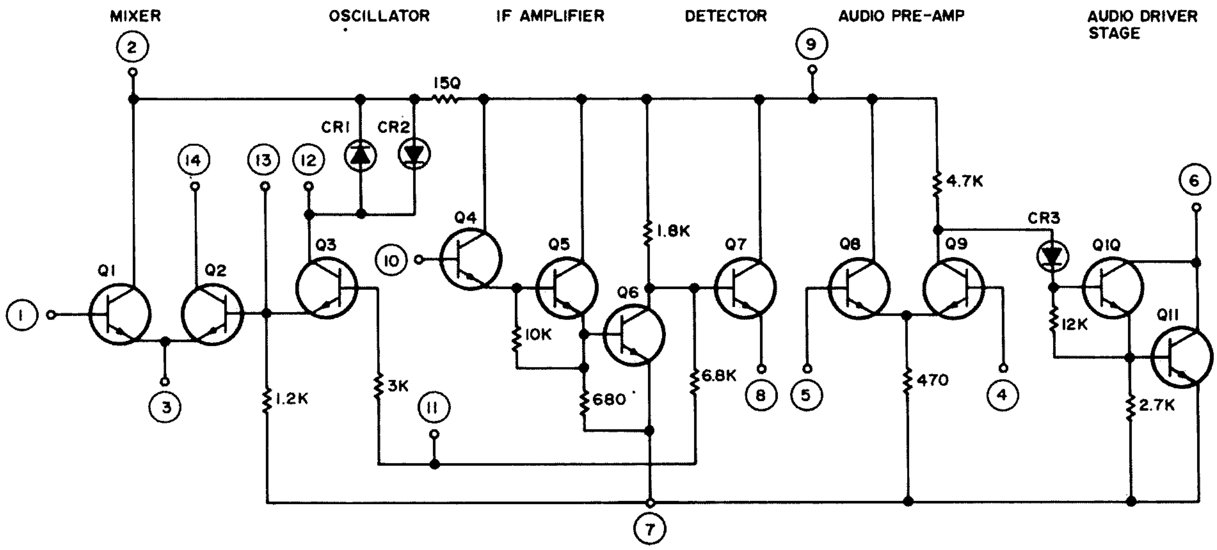


Fig. 1. Internal circuitry of the TAD-100.

tary pair to 0.7 watt audio output with a 6 volt supply.

External circuitry provides 20 dB negative feedback from the external audio output stage to the audio preamp to ensure consistent performance and to reduce the effect of supply voltage fluctuations. The agc voltage derived from the emitter of the detector controls the gain of the mixer through an external decoupling network and gives approximately 60 dB of agc range.

The ceramic i-f filter has a 3 dB bandwidth of 5 kHz and is 33 dB down at ±9 kHz. Ultimate attenuation is 90 dB. Audio distortion is under 2% at 0.6 watts output. Sensitivity for a 10 dB signal-to-noise ratio is just under 1 μV into 50Ω at 1 MHz. This figure will degrade somewhat at the frequencies covered by the SWL receiver. The sensitivity is quite adequate and signals from all over the world are easily received that are well above the noise even though an external antenna is not used.

Circuit

Figure 2 shows the circuit of the SWL receiver. Where possible, junk box or surplus parts were used to hold down cost. The values shown for the components in the audio and agc circuits are the recommended values from Amperex's Report No. S-144. In my receiver, substitute values were often used which closely approximated recommended values.

A ferrite rod antenna gives the receiver some degree of portability. This also allows an increased Q of the coil to improve selectivity. The ferrite rod was scrounged from a transistor radio so its characteristics are unknown. Some experimentation with the number of turns may be required to achieve proper coverage with different rods. If the receiver is used near a transmitter, back-to-back diodes should be connected across L1 to prevent damage to the IC.

The receiver tunes from 9.3 to 18 MHz. The elimination of bandswitching reduces circuit complexity. An imported dial from Allied Radio Shack serves as the main tuning dial. Bandspread is a little marginal using this approach but it takes only a few minutes to develop the necessary skill.

C1 is a surplus variable which has 3 sections of 50 pF per section. Only two sections were used. Similar capacitors can be substituted. C1A tunes the antenna circuit while C1B tunes the high frequency oscillator. C2 is a trimmer which achieves tracking between the antenna circuit and the oscillator.

The oscillator uses an RCA 40240 transistor. This inexpensive unit has a high beta and a high ft. Numerous oscillators have been constructed with this device and it always performs flawlessly. To cover the wide frequency range, a Hartley circuit was designed. The tuning capacitor comprises almost the entire tuned circuit capacitance

and thus permits the coverage of the wide frequency range. The oscillator operates at 455 kHz higher than the desired signal. This places its harmonics within the range of an all ham-band receiver at critical points to assist in receiver calibration.

A curious problem developed in the initial receiver design. L2 approaches self-resonance in the commercial FM band. Harmonics from the oscillator were strong enough to produce FM signals all over the dial. A simple low pass filter, consisting of L3, L4, L5, L7 and C8, eliminates the problem except for a few weak spurious signals outside the SWL bands. My location is within a few miles of some very high power commercial FM stations. If your location is less severe, the filter may not be needed.

The signal input is applied to the base of Q1 and is mixed with the oscillator signal applied to the emitters of Q1 and Q2. The 455 kHz i-f signal is taken from the collector of Q1 and passed through the ceramic filter, FL1. C26 must be a high quality bypass and should be connected directly between pin 11 and pin 7 of the TAD-100 using short leads. Some i-f instability was present using the manufacturer's recommended circuit. This was cured by using an additional bypass, C17, connected between pins 11 and 7 of the i-f filter using short leads.

After i-f amplification and detection by Q4, Q5, Q6, and Q7, the audio and agc voltage are present at pin 8. R1, R2, and C4 comprise a decoupling network with the proper agc time constant. The agc voltage is fed back to the mixer through L2. Bypass capacitor C13 is connected to the dc line rather than grounded to avoid i-f feedback. R5 and C18 form a decoupling network to prevent the 455 kHz i-f signal from entering the audio stages.

The audio stages are fairly straight forward. The RC networks are designed to provide proper bias for the stages, to provide negative feedback for improved stability, and to limit the frequency response to about 12 kHz. Amperex recommends the use of a potentiometer in parallel with a thermistor for R13. The author found no heating of Q12 and Q13 under normal operating conditions so the thermistor was eliminated.

Parts List

C1A,B Dual-section variable capacitor, 50 pF per section.
C2 1.5–7 pF trimmer.
FL1 Ceramic filter, Amperex part No. 8222 410 42010.
L1 11 turns no. 16 spaced over 2½" of a 5" x 1/4" ferrite rod.
L2 1 turn link wound over the cold end of L1.
L3, L5 19 turns no. 24 close wound on ¼" diameter form (use an old resistor 1 megohn or larger).
L4 Ohmite Z-144.
L6 27 turns no. 24 wound on 3/8" diameter slug-tuned form.
L7 4 turns no. 24 wound over the cold end of L6.
L8 1 turn no. 24 wound over L7.
Q12, 13 2N4107 (consists of one each 2N4105 and 2N4106).
Q14 40240.
Q15 Any NPN transistor in TO-5 can.
S1 On-off switch on R6.
T1 117 V.A.C. to 6.3 V.A.C. transformer, Olson T-76.
U1 Amperex TAD-100 integrated circuit.

Also, the quiescent operating point of these transistors did not appear to be critical so a fixed resistor was substituted.

The power supply circuit is standard with the exception of the filtered supply to the oscillator. The audio stages draw fairly heavy peak current causing the base-emitter impedance of Q15 to vary. This leads to enough change in output voltage to cause the oscillator frequency to vary if it is connected to the same line. Thus, voltage for the oscillator is taken from the zener diode, D5, which is much steadier. Q15 is an unmarked NPN junk box transistor. The requirements are not critical and nearly anything in a TO-5 can will suffice. If Q15 does not overheat when testing the receiver, it is probably good enough.

Construction

A homemade "L" shaped chassis and panel was formed from an aluminum cookie sheet. A surplus walnut cabinet from a small stereo receiver housed the unit. The tuning variable, C1, is mounted in the center of the chassis. The TAD-100 and its associated parts are mounted on one side of C1, and the oscillator and power supply are on the other side. The ferrite rod antenna runs parallel to the front panel on the rear lip of the chassis.

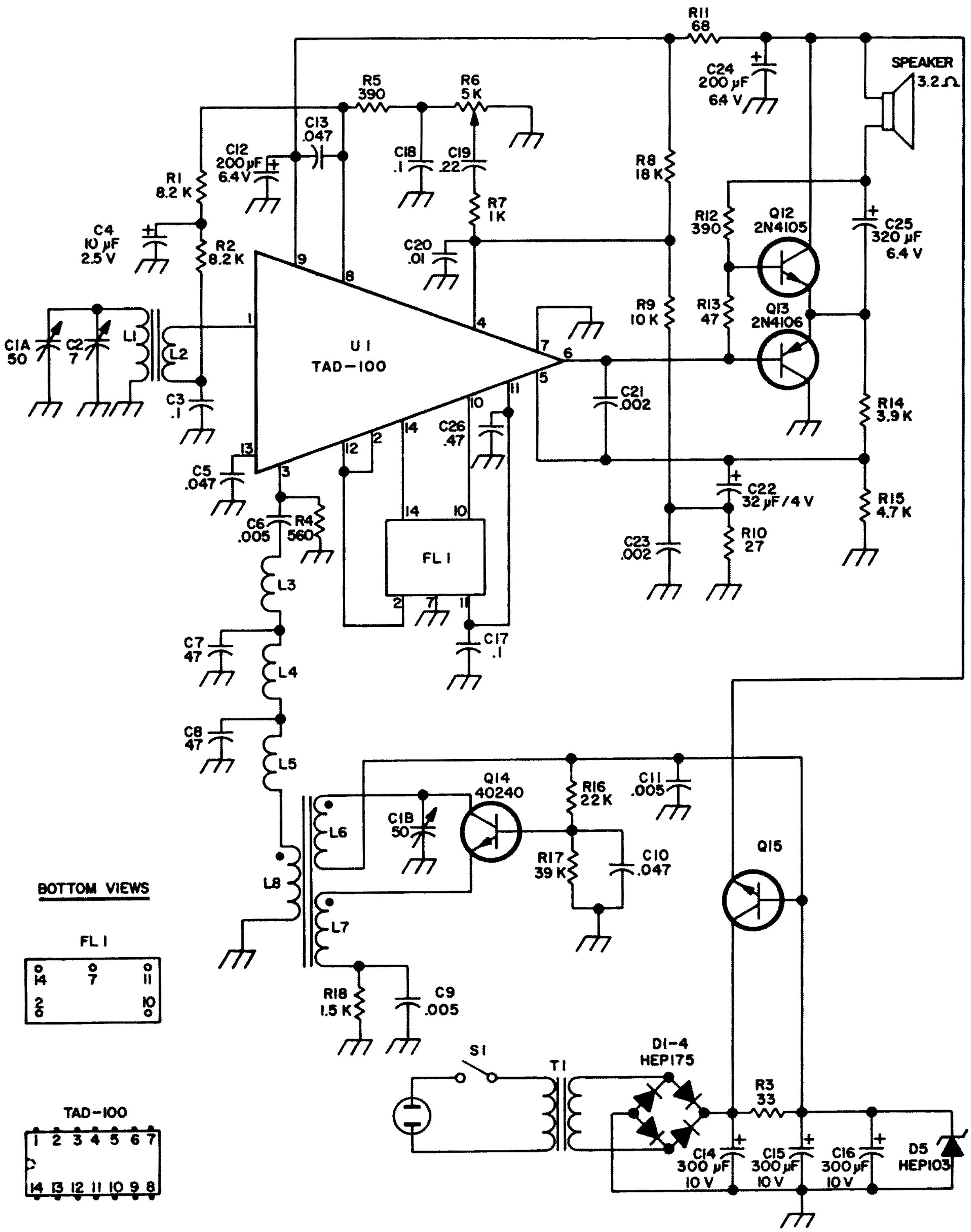


Fig. 2. Circuit diagram of the SWL receiver incorporating the TAD-100 IC chip.

Layout is not particularly critical but good rf practice should be followed. Be sure not to enclose the unit in a metal box or signals will be prevented from reaching the ferrite rod antenna.

The Amperex application note suggests mounting the components on a printed circuit board and the use of small transistor radio parts. In the interest of simplicity, direct wiring was used with components physically larger than the recommended parts. No unusual troubles were experienced. The TAD-100 is turned on its back with its "legs" in the air. Connections are made directly between the pins (use a minimum amount of soldering iron heat and application time) and several nearby terminal strips.

All ground connections should be made as directly as possible to pin 7. This is especially important for C26. C13 should be a small size ceramic capacitor and is mounted as close as possible to pins 8 and 9 of the TAD-100.

The ferrite rod is mounted several inches from other components to avoid feedback problems. In my receiver, a short piece of shielded cable connects L2 and the IC circuitry. A small vertical shield is mounted between the ferrite rod antenna and the oscillator circuitry to prevent oscillator harmonics from reaching the antenna circuit.

The oscillator and harmonic filter components should be securely mounted. The requirements are not too critical, however, since the received signals are AM. Several hundred cycles of drift will not cause any noticeable change in the received signal.

Testing and Calibration

All semiconductor devices are unforgiving of wiring errors and it is always a good practice to recheck your wiring job against the schematic. Also inspect carefully for solder bridges between pins on the IC and shorts between components. Apply power and check for approximately 6 volts at the emitter of Q15. Some noise should be heard from the speaker.

Calibration can best be accomplished at night when plentiful signals are present on the bands. The oscillator calibration is the first task to be accomplished. Tune a ham band receiver to 29.265 MHz and place a hookup wire antenna from the ham receiver to a point near the SWL receiver. With the plates of C1 fully meshed, tune the slug in L6, L7, L8 until the third harmonic of the oscillator is received by the ham receiver. This corresponds to an incoming frequency setting of the SWL receiver of 9.3 MHz. If no signal can be heard, check the polarity of the windings on the oscillator coil. L6 and L7 must be phased properly or the circuit will not oscillate.

Next, place your fingers on L1 to de-Q the circuit. As you tune up the dial, the 9 MHz shortwave band should be present over the first 20% of the dial and WWV should be heard at 10 MHz.

While listening to WWV at 10 MHz, adjust the spacing of L1, by compressing or spreading turns, until the signal strength is maximized. Continue tuning up the dial until, at about the midpoint, the 11 MHz shortwave band is received. Picking a strong, steady signal, adjust C2 for a peak in signal strength. This is only a temporary adjustment of C2 to get it into the proper range.

Next tune further up the dial to the 15 MHz shortwave band. Finally, peak C2 on a strong signal. The trimmers in FL1 can now be adjusted for the best sounding signal quality. After rechecking these adjustments, the receiver is properly tuned. The dial can be calibrated using combinations of oscillator harmonics as received on the ham band receiver, WWV signals, and received shortwave signals.

Conclusions

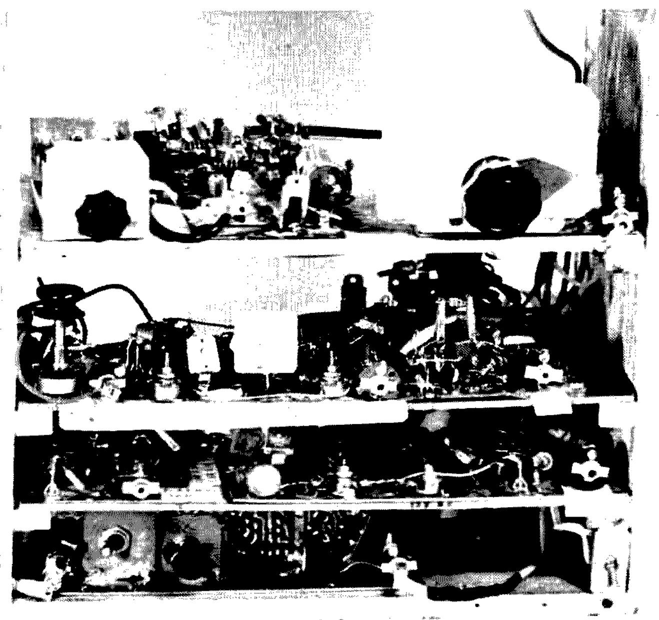
The receiver performs remarkably well considering its simplicity. Sensitivity is more than adequate to fill the dial with signals and the ceramic i-f filter ensures good selectivity. Not surprisingly, the lack of image rejection on the higher frequencies is noticeable. A very weak image on the 15 MHz WWV signal can be received for instance. Within the SWL bands, however, few problems exist.

The TAD-100 is a remarkable device and certainly should have broader applications. For example, by using the internal oscillator and tuning the input frequency to 1.5–2 MHz, an excellent back end for a portable two meter AM set could be constructed.

. . .W1GQG

FINAL ASSEMBLY AND FIRST NIGHT ON THE AIR

Bill Hoisington K1CLL
Far Over Farm
Peterborough NH 03458



(with the 432'er)

At last into the home-stretch with only a few trials and tribulations ahead. You wouldn't expect a complete station to go together just like that would you? It almost did. Nothing really serious, but it might hit you too, so here are the details.

My only 54 MHz rock, left over from dry-cell battery tube work of ten years ago, has always had a big "W" inked on it. This is my symbol for weak, and it was. Worse than that it developed a particularly virulent form of nastiness. You couldn't exactly call it intermittent, it just faded away or wouldn't come on at all.

I plugged in a good 53 MHz crystal and the output power jumped as did the exciter mils as the multiplier stages got plenty of drive. This was fine, but of course the last doubler was now on 424 instead of on 432

There remained the tripler exciter, which showed an insufficient amount of driver, as mentioned before. The obvious answer was another rf stage, a "pre-driver" as it is called in solid-state circles. There are four rf stages in the shack now, so one was tried out and worked even better than the doubler exciter alone, like *over* 150 mW output on the final. All four of these little planks are in use however, so I had to throw another one together for this pre-driver stage.

Figure 1 shows the details which by now with the use of lumped circuits constitute practically a standard schematic for 432 MHz. At least they all work well.

Now we have a tripler crystal exciter and three rf stages, but we also have increased drive and more output.

Another knotty one. Or rather two together. When running high gain low frequency selective circuits, nuisance feedback is easy to come by. This is one you may well encounter, so we'll warn you now, and furnish the remedy also. The 135 i-f strip and af were running fine, but as soon as the 1.65 MHz i-f was plugged in, zilch . . . S meter dropped near zero, and the darndest low af rumble and warble you ever heard came out of the speaker with a hashed-up signal also. With separate batteries – fine – but that's no solution. Inclusion of a 100Ω resistor in the plus battery lead to the B plus bus in the strip did the job, except for the second part of the trouble which was the resistance of the outer conductor of some old thin braided microphone cable being used to connect the two i-f strips. The outer conductor actually measured 1/10thΩ, so beware of that stuff. Even a good piece of new RG-58 cable when used with connectors which were not absolutely new and shiny

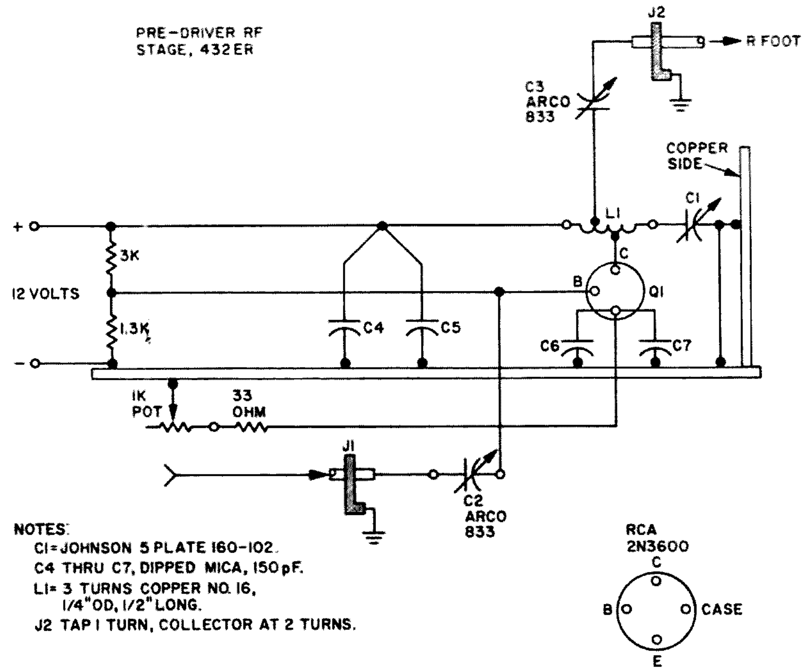


Fig. 1. Pre-driver rf stage, 432'er.

caused trouble. I mean the connectors, of course. A good short ground between the two strips did the job right. When you want smooth, trouble-free operation of high gain stages, you must take certain precautions.

There is something fascinating about a good double-frequency i-f that handles well, is free of feedback, has good avc, and doesn't cost too much, so your buddy can duplicate it and take it with him to another mountain 100 miles away. That is, it's fascinating once you get the bugs out of it.

Sorry, OM, but there's another i-f to connect to that same battery, and yes, I know, don't tell me, the same thing occurred again. Low frequency burble and rumble, when the ten meter receiver-tunable i-f was plugged into the 1.65 MHz i-f strip, and also into that one battery. This time the remedy was soon applied with another 100Ω resistor doing its stuff in the B plus load. There was a 100 μF capacitor to ground already in the strip from that bus.

Improving the I-F Stages

The i-f stages were originally built with some five year-old PNP devices I had around, and in the interests of battery compatibility, it was thought best to change over to NPN jobs. Improvements in burn-out and better noise figures were obtained with these, as well as less confusion in circuitry and battery polarity. A negative ground can now be used throughout, and you can forget about PNP transistors except possibly for high power modulators later on.

No change in the coil windings was needed, other than to lift the collector return from ground and bring it to the plus 12 volt bus. Figure 2 gives the final i-f circuit which works like a charm.

DC Levels

When changing transistors in an i-f strip or of course when making up a new one, it is very important to set up the dc levels on the emitter and base of each device including the diodes. I say diodes because once having tried separate diodes for af and avc I'll never go back to a single one again.

Referring to Fig. 2, the base dc level of Q1 is set by R2 and R8. These are not critical but must be set properly. A balance between R2 and R8 is important for proper avc action. If R2 is too small too much current will go through Q1. If R8 is too large too much avc voltage will be lost in it. The values shown work fine with 2N918's. A one millimeter in the emitter lead of Q1 should drop from 6 or 8 mils to less than 100 μA

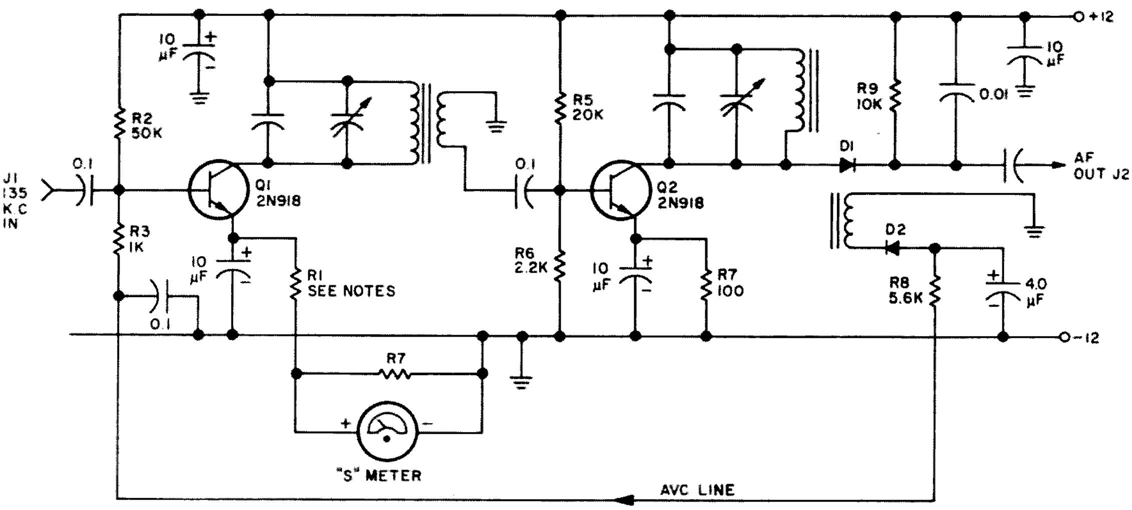


Fig. 2. 135 kHz i-f strip reworked for NPN transistors.

with almost any kind of a good signal at J1. I use a little homebrewed attenuator box as in Fig. 3 with the Lafayette signal generator on 135 kHz for those low signal level tests. Do not expect to be able to do this on the higher frequencies though. Those kind of shielded generators are in the $300 to $400 range instead of the $30 to $40 one.

The two emitter pots in Fig. 2 are practically standard items, 500Ω or 1K, with limited resistors of 33–100Ω, depending on just what devices you are using to keep maximum current below 10 mils (in most receivers under test here). Final good, smooth-working values are given in Fig. 2, using the 2N918's I have at the moment in the 135 Hz i-f strip. These are higher frequency devices than needed. 2N916's would be just as good.

Once you get them adjusted to where you want them, you can of course go to only one pot for the i-f gain control.

Choice of Bandwidth and Gain Handling of the two I-F Strips

This has worked out fine. Each of these strips originally had a pot in each emitter of each stage and one for both stages together. In use on the air I find that the last two stages which make up the narrow band high selectivity strip on 135 kHz can be left alone at a fixed gain, and the over-all gain can be set by the pot which controls both the emitters of the 1.65 MHz strip. This one also serves to set for maximum the gain of that strip when it is used alone. So much for i-f gain.

The choice of i-f bandwidth can be very useful at times. The narrow band i-f requires careful tuning and can be subject to certain crystal and other oscillator drifts, not only in your rig but the other lad's as well, and also with temperature changes and possible voltage drops. It is smooth and steady when used on the air, as you will see later, but when it comes to making all sorts of antenna and rf stage tests there's nothing like a little bandwidth. By "little" I mean a "good little amount of it." The 1.65 MHz strip provides just that with about 100 kHz bandwidth. All you have to do with the rig (as now put together) is change over the af plug from the narrow band to the broad band strip, *et voila*, instant ease of adjustment. There happens to be an "S" meter in this strip also, so all kinds of relative measurements can be made on antennas, cables, rf, etc. The sharp i-f rules the roost though with the band loaded (on 432 that's more than one other station!). And of course when the band opens it is an absolute must.

Installing the Two Low Noise Stages in the Rack.

Just for security against feedback these were mounted on a single copper-clad base-

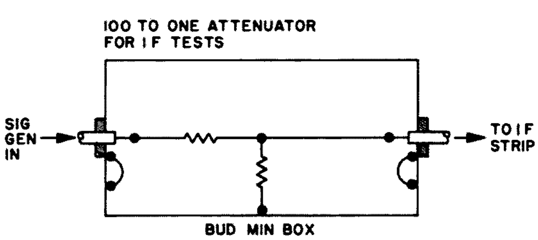


Fig. 3. 100:1 attenuator for i-f tests.

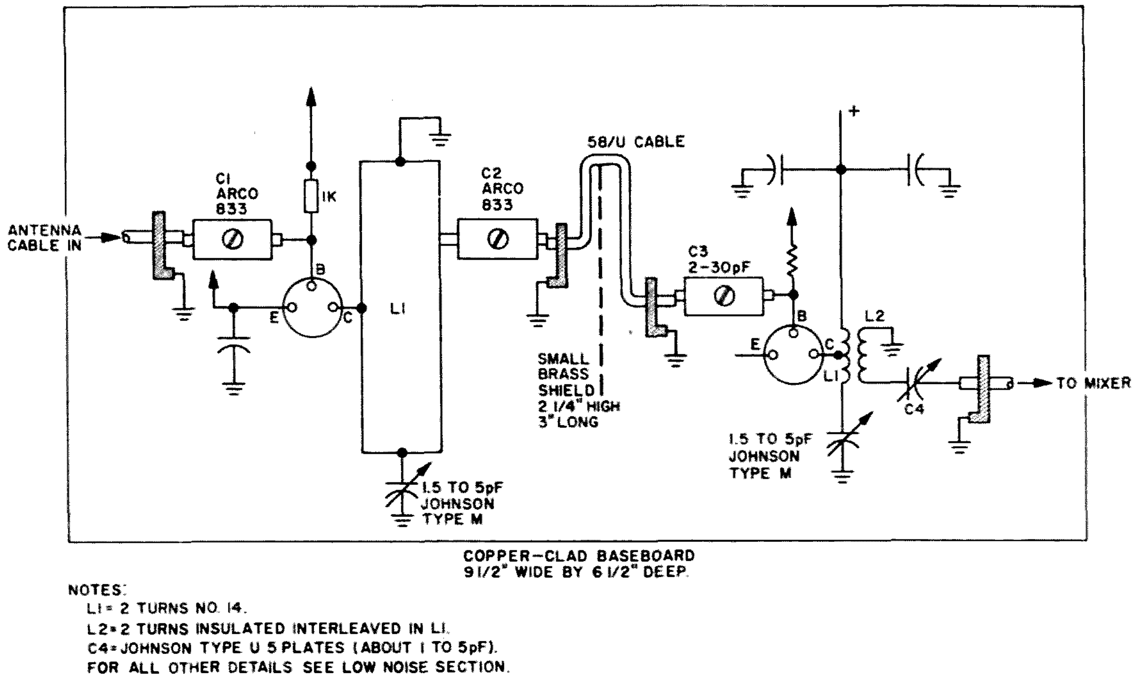


Fig. 4. Final layout, low-noise rf stages, receiver, 432'er.

board on the top shelf and given the filter treatment in each plus 12 volt lead. A small shield near the coil job removed a slight trace of rf feedback under certain tuning conditions. The layout is shown in Fig. 4, with the main points for tuneup and adjustment being C1, C2, C3 and C4. No bugs showed up here. The manufacturer of these low noise devices, KMC Semi-Conductor, Inc., Long Valley, N.J., states that for the best noise figure use only a few mils, like 2 or 3. This was found to be true, although the gain goes up when 10 mils are used. Remember though, gain we've already got, low-noise is that illusive thing we're after. On this subject, the 1 mW test signal on just a dipole was still coming in five miles away.

Bonding

This may sound like a low frequency thing, but it goes for both high and low and in between. On the low frequencies you can get that nasty af rumble with the S meter going toward zero without any signal; on hf you can get hand capacity when tuning with a narrow band i-f; and on UHF you can get most anything. Like oscillations in an rf stage, rf tuning reaction onto the crystal-controlled local oscillator. (Yep!) Don't forget the frequency multiplication for the 48 MHz rock up to 432 is nine times, and a mere 300 cycles can throw you out of the receiver pass band. After mounting everything on the carrying rack shelves, beginning at the bottom, with the af and battery, then the 135 kHz strip; next the 1.65 MHz job; tunable i-f mixer, and local oscillator on the third shelf, and the two low noise rf strips on top. Bonding was installed piece by piece, checking on that weak signal all the time, as well as for tuning and handling. For this type of bonding I use No. 12 solid copper wire in pieces only 2–4 in. long between the copper-clad baseboards on the shelves. While some of this bonding cut down the signal slightly due to elimination of nuisance rf feedback, the entire job brought the signal up and eliminated remaining traces of feedback and hand capacity.

It is hard to draw the line between a collection of miniboxes and 100 lbs of iron (I mean copper or aluminum) clad construction costing you-know-how-much. What I'm after, and I think most readers would like also, is to finally have a good battery-operated, low-cost receiver that you hear DX with on 432 that handles well, not too touchy or jumpy, and still has room for improvement and growth. Sounds like a pretty big order, and it has been actually that because – including the transmitter – it has taken over *three* months to build all the units, work out the bugs, draw up the circuits and layouts, and get everything

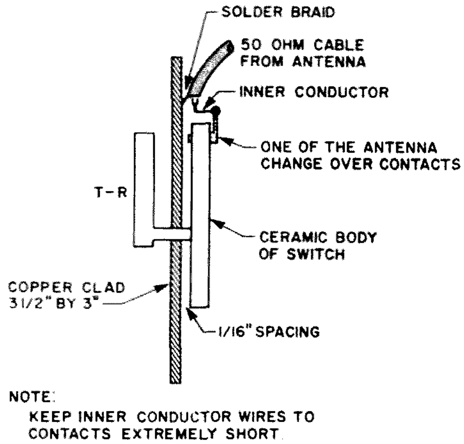


Fig. 5A. TR switch, 432'er solid state.

running smoothly. That three months, I might mention,is on a six-and-a-half days per week basis. And it won't take *you* that long because we've worked almost everything out for you, and you can start from there.

The T-R Switch

There is an easy way to handle this in a battery-powered rig; just use a rotary ceramic switch, reworked a little for UHF. Proof of the pudding is on the air.

The main deal is to keep the contacts as close as possible to a flat ground-plane backing for the switch, as in Figs. 5A and B. I have tested this out on 432 MHz, and there is no noticeable loss involved in going through the switch. Use one set of contacts, as in Fig. 5B, for the antenna changeover section; the rest can be used "as is" for dc connections to turn on the transmitter, turn off the receiver, etc., with no special precaution needed in their wiring.

The switch is mounted on the transmitter, although it could be put on the receiver rack just as well.

With medium size beams and (see later) antenna mounts for use on the sides of both the transmitting and receiving racks, along with the T-R switch, considerable flexibility of operation is obtained. Either the transmitter or the receiver can be used separately with their own portable beam in the car or shack, or with a really big beam for serious mountain-topping. With the latter the T-R is right there ready to be used.

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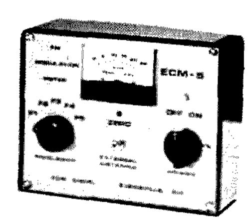

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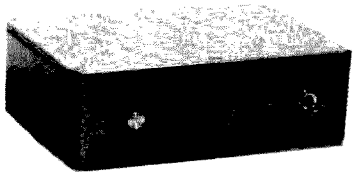

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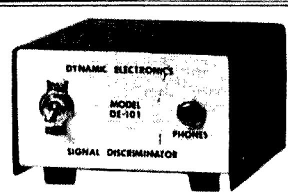

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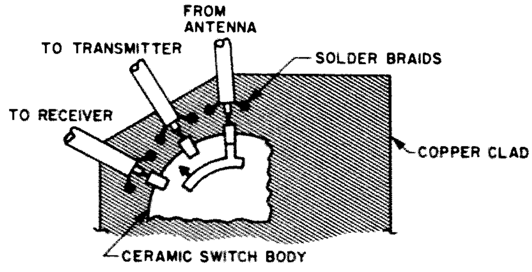

Fig. 5B. Rear view, TR switch.

the T-R switch to turn them on and off along with the antenna changeover. I haven't seen any low-cost battery-operated relays as yet, but with the power available for UHF solid state at present this can be omitted.

The use of two racks in the car is not so handy, but the units will soon be boiled down in size to where they can go on one rack. First and foremost is the circuit and its components. When you have these and they work well, then you can plan how to put them into little boxes, but not before.

Car-top Antenna Mounts for the 432'er

The first thing to do is make a visit to Sears & Roebuck for a $8.95 car-top carrier. They have one with wood cross bars which is just fine for mobile beam mounts, as well as for carrying big beams if you're the ambitious type. I generally position the two transverse bars in the normal fashion on the car roof and then bolt on a 1 x 8 in. plank running fore and aft for the beam mount which is hand-rotated from the driver's window. See Fig. 6.

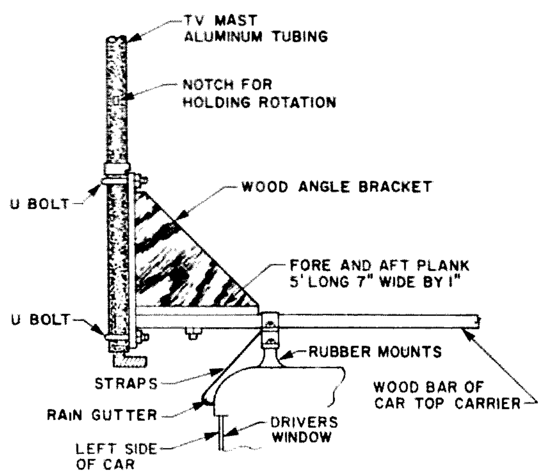

Fig. 6A. Car-top antenna mount, 432'er. View from rear of car.

The use of a beam antenna on a car is to me a very intriguing affair. You will find

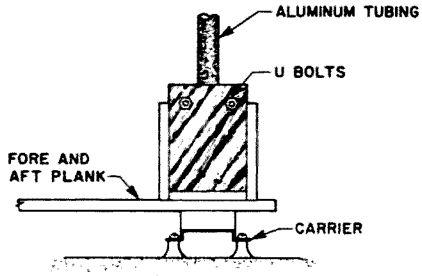

Fig. 6B. View from right side of car.

that most of the time on the main highways, the direction of the beam stays pretty well put, and only changes over reasonable periods of time. For example, when coming into a city from 30 to 40 miles out, you keep the beam pointed mainly ahead for half an hour, and then while you're going through or around town, the signal is loud enough almost anywhere you point the beam; as soon as you get out of town, you point the beam astern and leave it that way for another length of time. The advantages are great! The beam reduces flutter almost entirely with some 9/10ths of your power going toward the other lad and not bounding all over the scenery. There is 10 dB of gain for a good 4 elmeent on two for example, and it can tell you where your friend's house is if you want to drop in for a visit and see what he looks like!

I have started out from Boston at 5 pm on two meters with a 4 element beam, going to Washington, D.C., and wound up near the Bay Bridge in Maryland at 2 am with steady QSO's one after the other all the way.

Using a plug-in type of mast mount you can run a 4 or 8 element beam on the car and change to a much bigger one when you get to your favorite hill-top. You can also plug in beams for other bands, or even two big "wheels" stacked if you really want to excite comments.

Figure 6 shows details of the car mount, almost all wood, and after the use of a can of aluminum spray paint (do this off the car) it looks fine.

You can use a good height above ground like the big truck trailers, but watch out for places like the Merritt Parkway toll booths. They were *not* made for trucks. You have to stop out on the side and cart your dime over to the man on foot.

When you use this mount with a larger beam on a mountain-top location, better carry along tnree small guy ropes for emergency use, with a rotating collar. Those winds come up in minutes, and they blow. In many places you don't need extra elevation, but sometimes you will find yourself in a parking lot just enough down off the top of the hill to cause you trouble and will need that extra 10 ft of height. Mt. Cadillac is one of them, Down East in Maine.

Handy Beam Mounts and Fittings

As usual the TV boys help us amateurs out with mass-produced handy items such as the 1¼ in. OD aluminum masting for $1.25 per 5 ft or $2.09 for 10 ft, plain. The $1.25 bit is for "gold anodized" whatever that might mean. The new style plumbing lads also help with their black plastic PVC (polyvynl-chloride) pipe which fits just nice and snug inside the aluminum masting.

Figure 7 shows a handy rig for portable work with the shelf racks, either transmitter or receiver or both. The same antennas that plug into these mounts also plug into the car-top mount, as you will see.

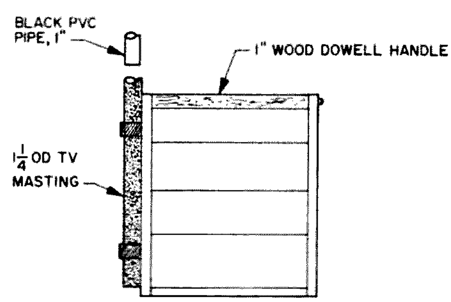

Fig. 7A. Wood rack antenna-mount, front view.

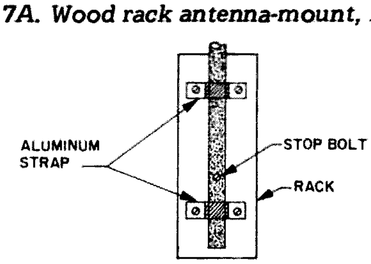

Fig. 7B. Side view.

Medium Size Beams for Portable and Car Use with the 432'er

Two and three element designs (Figs. 8 and 9) are given to start you off portable, car, and in the shack. A high gain 14 element job that you can install on your roof or carry up the hills on the car is shown in Fig.10.

Figure 8 shows the 2 element unit. This is

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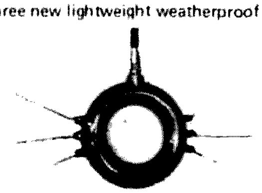

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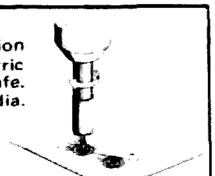

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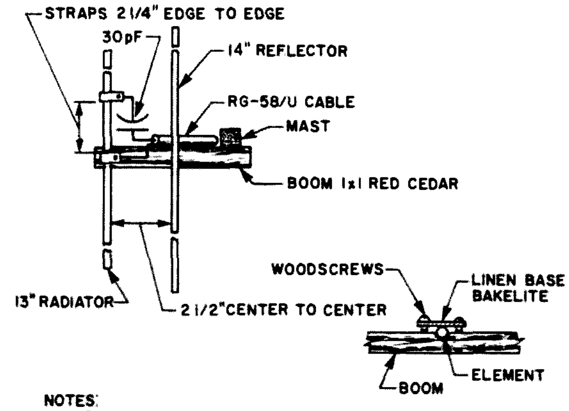


NOTES:
1. 1/8" CLOTHSLINE ALUMINUM USED FOR ELEMENTS.
2. SMALL BRASS STRAPS AND 2/56 NUTS AND BOLTS FASTEN COAX CABLE TO RADIATOR.

Fig. 8. 2-element portable beam 432 MHz, top view.

handy for test use, hidden transmitter hunts by your club, and what have you. It's also good for making up multi-element flat shaped beams which carry nicely on the car.

Next comes the 3-element one, naturally, with Fig. 9 showing details. Don't forget you can hoist one of these up 20 ft in the air at a moment's notice in an emergency with a couple of 10 ft aluminum masts.

We then make a jump to a 14 element job because the red cedar boom is still only 10 ft long.

The elements are the same 1/8th in. clothesline (aluminum, that is) and the time involved for building should run around half a day if you have all the material. The gain appears to be over 15 dB and of course you can always stack up two of them – although the car-top carrying and mounting gets quite a bit more difficult.

First Mobile Tests

With everything working (I hoped) the 14 element was mounted 10 ft from the second floor porch and pointed out along the road to the south, plugged into the transmitter, and the af gain opened up to give some modulation. The little 3 element beam was installed 5 ft over the car roof on the hand-rotated mount of Fig. 6, plugged into the receiver, and away we went.

Sounded good as the air conditioner motors in the shack came through the af. Yes, it does get over 80 up here sometimes, but the difference is you run a heater first at 5 or 6 am (when I start writing!) and then at 11 am you have to turn on the air conditioner. All in the same morning!

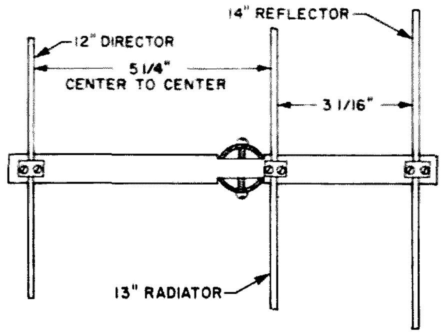
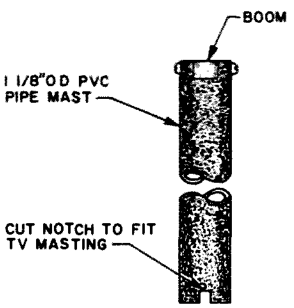


Fig. 9A. 3-element portable beam, 432 MHz, top view.



The enhanced shadow-effect of 432 as compared to 2 meters was quite noticeable, at least to yours truly with quite a few years of 2 meter beam mobile work. An 8 element, 4 high by 2 wide, will be tried soon on 432 on the car. Possibly even a 4 by 4 would be interesting on 432 mobile. This one will have to be set back into the middle of the car roof, though. CUL with ideas on that one.

First Evening on the Air

All I can say, as in the Olson and Johnson shows, is "What a night, what a night." After all, this all-solid state rig has been some months building, has a triple-conversion receiver, three amplifiers in the transmitter section, and had never been on the air yet. Would I even hear anyone?

I did. Up on Monadnock, with the 14 element on top of the car with a 5 ft extension I started listening and calling, a little early so it happened. After the usual radar signals, FM harmonics from out Springfield, Mass. way, and some odd sloppy-pulse jobs at about ten cycles (anyone know what they are?) finally a good CW station came on, peaking fine on the beam, pounding in, real good, "K3EAV portable one." I didn't raise him. Evidently doesn't listen for fone.

Then at last "CQ from W1SNN, Waltham, Mass.," over 50 miles anyway. The receiver works well. So does the transmitter, because we then had a nice QSO, my first on 432 for quite a while. I did a lot of switching back and forth between the two bandwidths on the receiver, with the following results. With the broad band i-f you can hear all the stations fine but with all of them being close to 432, you can hear several at once, naturally enough.

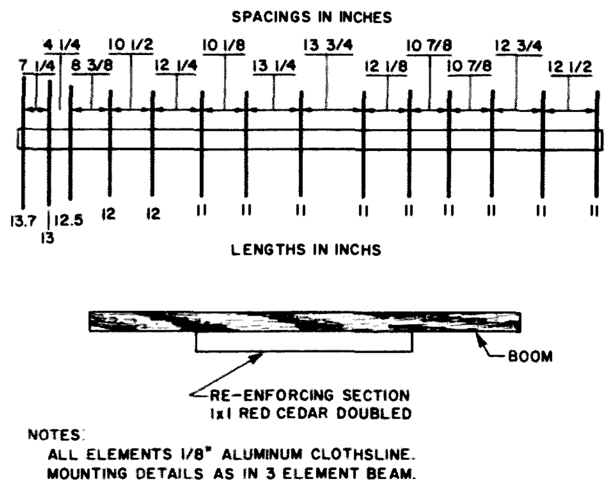


Fig. 10. 14-element beam, 432 MHz.

At six miles through trees and small hills, the signal was still plenty loud and showed signs of going further, but the shadow effects of large hills prevented further tests that day. Also I wanted to get the whole rig into the car with one of those 14 element jobs ready for an evening on Pack Monadnock Mountain, as it was Wednesday evening which is 432 night on the East Coast at least.

The sharpness of the 135 kHz strip showed up well, separating even heterodyning stations. Yes, even QRM developed on the band as the evening wore on. The rest of the log for the evening reads, K1BFA, Westford, Mass.; W1JIZ Harvard, Mass., WA1JTK Nashua, N.H, and W1EUJ, Tyngsboro, Mass. So the rig does work and it's lots of fun.

I'm not crowing, and I don't intend to keep them in the rig forever, but "RCA type" 5¢ phono jacks and plugs are used throughout the rig, as well a 10-year-old RG-58/U cable. Again, I'm not advocating their use, but it shows what can be done on 432 if you really try.

...K1CLL

William N. Carver K6OLG
Box 1029
Livermore CA 94550

TRANSISTOR KEYING CIRCUIT

In the last several years a number of excellent electronic key designs have been presented to the amateur. Whether they have memories, dot insertion, or a variety of other features, they all have been second-rate in one respect. The actual keying of a grid-blocked transmitter is unsatisfactory.

Relay keying of transmitters

Most keys use a relay for transmitter keying. This allows a wide range of voltages of either polarity to be keyed. There are many drawbacks to this system, however. Unless the relay is a high-speed type and is properly driven it may not follow even moderate sending speeds without bias. The fact that the integrated circuit keys do not have a weight adjustment means you cannot compensate for this relay problem.

Reed relays have been used to obtain faster operation. Unfortunately the contacts of reed relays are delicate and tend to weld together or "stick" if a protection network is not connected across them. This network must be tailored to the voltage and current being keyed.

Even the reed relay has contact bounce. This contact bounce can be overcome by using a mercury wetted reed. However, the welding problem of dry reed contacts remains and in addition the wetted reed relays must be operated vertically at all times. Of course all relays make annoying clicking noises.

Transistor keying of transmitters

Transistors offer an excllent way to key the transmitter. They are extremely fast, quiet, have no contact bounce and will operate almost forever. Transistors do have one practical drawback. They will not tolerate voltages in excess of their "breakdown" voltage. In the last few years many NPN transistors have been introduced which can key in excess of +350V at low cost. They will perform cathode keying flawlessly.

Grid block keying cannot be done quite as easily. The transistor used in this service is nearly always a 2N398. This is an old germanium transistor, very leaky, and capable of switching only about −100V. The leakage tends to cause backwave or incomplete cutoff of the final amplifier in some transmitters. If the key-up voltage of the transmitter is higher than −100V several 2N398s must be "stacked" to prevent transistor breakdown. The usual result of the stacking procedure is the loss of several transistors at one time.

The 3N4888

Having gone through every problem mentioned above in a series of keys using tubes, transistors, and finally integrated circuits, the need for a high voltage PNP transistor for grid-block keying was obvious. Silicon transistors were desirable for their low leakage current. The cost of silicon

transistors capable of withstanding a few hundred volts was very high – on the order of $10 a piece. Then Bob Felton K7WLX, "discovered" the 2N4888. This is a silicon PNP transistor in an epoxy case. It has virtually no leakage and can withstand about –300V in the proper circuit. Best of all, it costs only about $1, less than the relay it outperforms!

Breakdown voltages

The 2N4888 is guaranteed to withstand at least –150V. While this is adequate for many transmitters, it is possible to extend the breakdown to over –300V. This is because of the fact that the voltage at which a transistor breaks down is dependent upon the circuit into which it is placed. If a voltage is applied between the collector and emitter of a transistor while the base lead is left unconnected, the breakdown voltage is called BVceo. If the base is then shorted to the emitter and voltage is applied between collector and emitter the breakdown voltage is called BVces. The fact of importance to us is that BVces is always higher than BVceo. It may be as much as twice as high for some transistors. For the ten 2N4888 transistors I have tested BVces ranged from –275 to –350V, quite sufficient to key any transmitter in my experience.

In a practical circuit the base of the 2N4888 will be shorted to the emitter by a second transistor to achieve the higher BVces rating. The keying would be inverted by this two-transistor circuit so a third transistor is needed to return keying to the same sense as that of a relay.

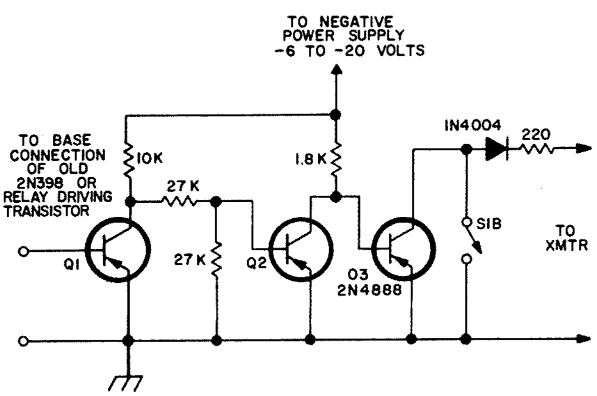
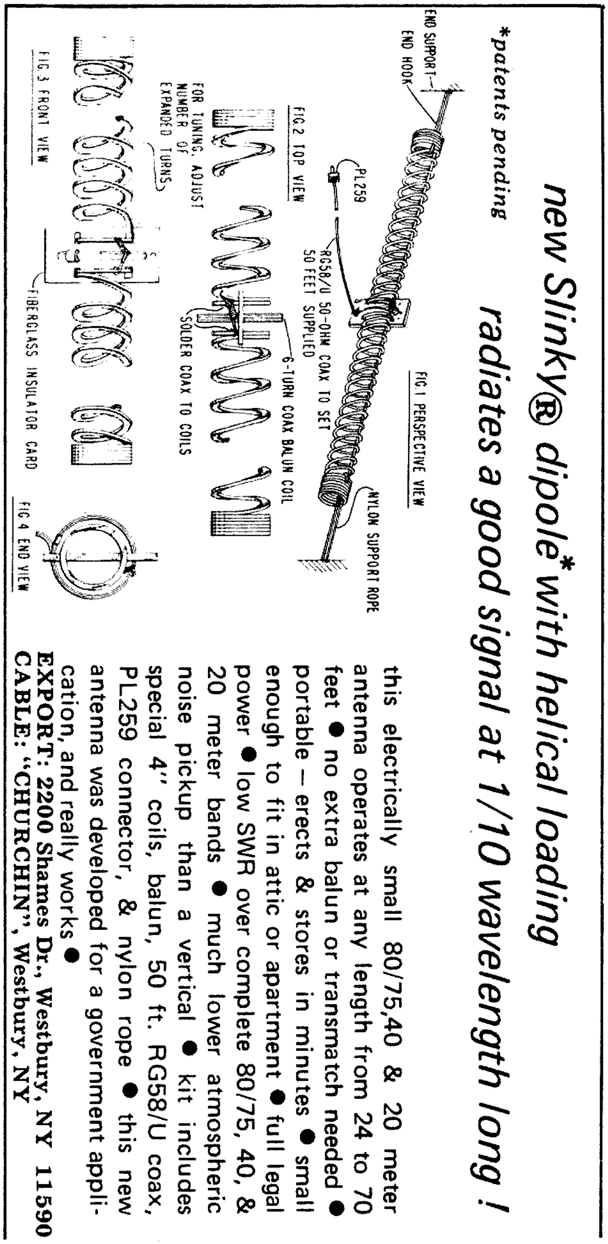


Fig. 1. Grid block keying the PNP transistor keys.



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The 2N4888 in transistor keys

Figure 1 shows the three-transistor circuit as it would be connected to a PNP transistor key. The original key circuit is immaterial, usually consisting of 2N107 or 2N404 transistors. The base of Q1 is connected in place of the relay keying transistor or the 2N398.

All three new transistors are silicon. Q1 and Q2 were 2N3638, but MPS3638, 2N4125, 2N3702, 2N3703, or similar transistors should work just as well. Q3 is the 2N4888. Resistor values are not critical and the circuit works with the usual power supply voltages found in keys of this type.

To prevent inadvertent application of positive voltages to the 2N4888, a silicon power diode was placed in series with the collector. To prevent current surges from fusing the 2N4888, a 220Ω resistor is also placed in series with the collector.

The ac switch of the key should have two sections. The added section, labeled S1B, shorts the 2N4888 collector when the power switch is turned off. This protects the transistor if the transmitter is left on and the key is turned off. Remember, unless the 2N4888 has its base and emitter shorted by Q2 the breakdown voltage will be only BVceo. In such a case if the key-up voltage of the transmitter exceeds −150V the 2N4888 could be damaged. S1B prevents this possibility.

Before using the key, measure the voltage between the base and emitter of Q3 with key power turned on, but not operating the key lever. The voltage should be less than a few tenths of a volt. Next, *with a VTVM*, measure the key-up voltage of the transmitter. Since this may depend upon "spotting" or tune positions be sure to look for such differences. If the highest voltage does not exceed −250V plug in the key and start enjoying transistor keying.

If your voltage lies between −250 and −325V it is a good idea to buy several 2N4888 transistors and test them to find one having highest breakdown voltage. Figure 2 shows a test setup which can be used to test BVceo and BVces. The test should be performed carefully as follows to

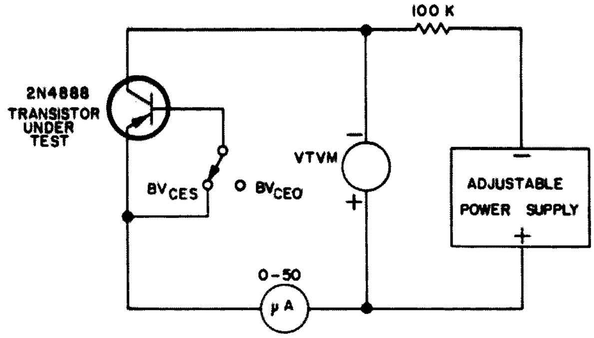

Fig. 2. Testing the breakdown voltages of the 2N4888.

prevent damage to the transistor: power supply voltage should be raised slowly while watching the microammeter like a hawk. The moment a microampere or two is indicated on the meter, read the VTVM and remove the test voltage. High voltage transistors have different failure modes than the low voltage types and appreciable current should not be allowed to flow.

Adapting IC keys with the 2N4888

Figure 3 shows the 2N4888 in a simple integrated circuit key, the "Micro-TO" described in the August 1967 issue of *QST*. Common IC's such as those used in the Micro-TO require +3.6V. The PNP nature of the 2N4888 demands negative voltages. These conflicting requirements can be satisfied without adding another power supply by changing the ground reference terminal of the whole Micro-TO circuit.

All points which were originally grounded (including the key lever, power supply transformer center tap, and filter capacitors) are bussed together and lifted from chassis ground. This becomes the −3.6V terminal for powering the new circuitry. All points which were formerly +3.6V are grounded to the chassis. Since the ground terminals and +3.6V terminals of the circuit are probably buss wires on a printed circuit or perforated board the change requires moving only a few wires. After this change the integrated circuits are, in effect, "standing on their heads." They don't know the difference, however, and operate just as before. The PNP transistors see the −3.6V they require so everyone is happy. Total cost of the conversion is held to about $2.50 by this trick.

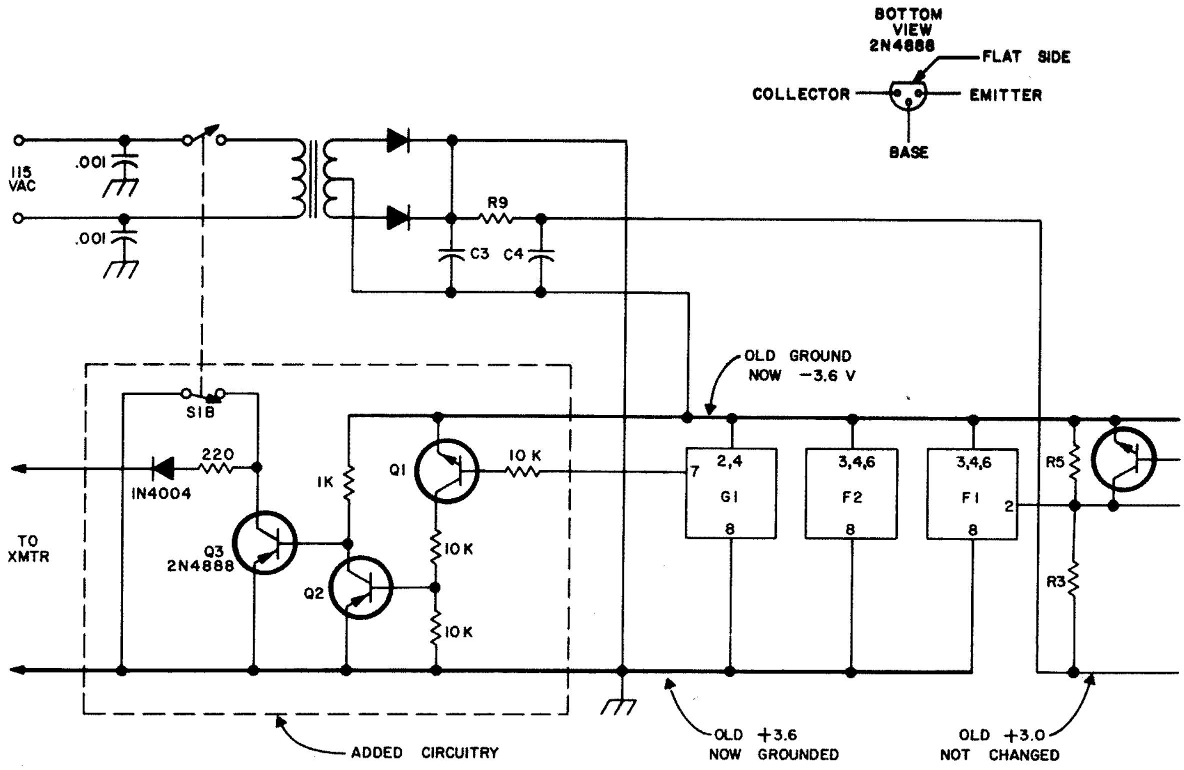

Fig. 3. Grid block keying with the "Micro-TO."

Four 0.001 μF bypass capacitors are used in the Micro-TO. Two are used to bypass the ac line, two bypass the key lever contacts. These bypass capacitors should be excluded from the ground change: they remain between their respective wires and ground in order to prevent stray rf from entering the key.

Note that Fig. 3 does not show all of the Micro-TO circuitry, just the power supply and power connections of the ICs. Interconnecting wires between portions of the circuit were not changed in any way from the original schematic.

Q1 is a silicon NPN transistor. Almost anything will work here, the 2N3392-93-94 series, 2N3704-05-06 series, 2N5183, and 2N706 being suitable types which are very inexpensive. Q2 is a silicon PNP, 2N3638 or equivalent types discuessed in the transistor key adaptation. Resistors are not critical and anything within 20% of the indicated values will be fine.

The protective diode, resistor, and switch are used in the IC key modification just as they were used in the transistor key modification. Again, any silicon power diode with a PIV of about 400V could be substituted for the 1N4004.

Testing procedure for both key and transmitter are the same as was described for the transistor key modification.

Other types of IC keys can use the 2N4888 by changing the ground reference as was done here with the Micro-TO. My integrated iambimatic key (IIKEY) uses this identical technique and circuit.

Finding the 2N4888

The 2N4888 is a Fairchild resistor and may be hard to find. A letter to Fairchild Marketing Services, Box 1058, Mountain View, California, asking for their *"Fairchild Stocking Distributors List"* will give you a source for their transistors and integrated circuits.

Results

I've used two homebrew transmitters, an Apache, and an SB101 with four different keys using the 2N4888. Results have been uniformly successful. Transistor keying is quick and flawless – a definite improvement over the clickety-clack of relays.

. . .K6OLG

Warren MacDowell W2AOO
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USING A SEVEN-SEGMENT READOUT WITH A NIXIE DRIVER

During the construction of an electronic clock or frequency counter, the type of readout employed can be a deciding factor in the overall price of the unit. The LED (Light Emitting Diode) type of seven segment readout is quite a bit more expensive than those of the "Nixie" type. The driver integrated circuit for the LED readout generally is more expensive than the driver for the "Nixie" tubes. Most of the LED readouts are low voltage devices (approximately 5V) and work with a low voltage type of driver such as the Texas Instruments SN7447 IC.

One of the better deals we have discovered is the SP-733 readout which is manufactured by Sperry Rand. The SP-733 is used by Heathkit in their new IC-2008A calculator and sells for about $7.35 through Heathkit outlets. Of course these are intended for replacement use in the calculators. The SP-733 contains *three* complete readouts in a single flat enclosure. Therefore, the price per readout comes to $2.45 each. The SP-733 is a seven segment device; however, it is not compatible with either the SN7447 which is a low voltage seven segment driver, or the SN7441 which drives individual numeric high voltage "Nixie" tubes. The SP-733 requires approximately 200V dc on each of the seven segments through a 22,000Ω ½W current limiting resistor in order to illuminate the segments.

Due to the reasonable price and compactness of the SP-733 (4.2 x 2.8 x 0.5 cm) we were prompted to try and make it compatible with a "high voltage" Nixie driver such as the SN 7441. The SN 7441 was constructed to ground only the single numerals of the Nixie tubes. Therefore it was necessary to come up with a proper diode matrix that would interface the SN 7441 and SP-733.

We were fortunate enough to find some computer boards on the surplus market that contained over 300 glass bead type of silicon switching diodes. These boards sold for less than $1 each. The silicon diodes were pressed into service and worked very well without a single failure. The voltage across

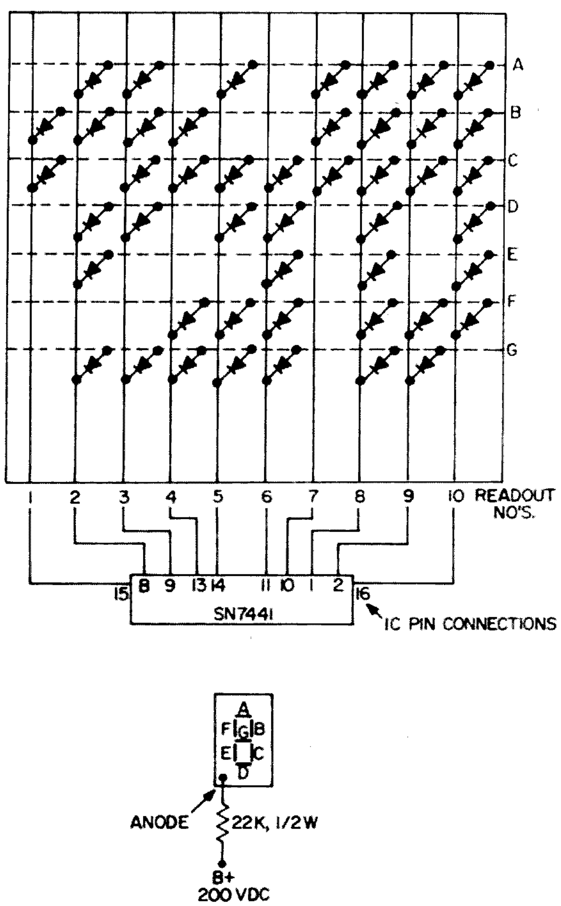
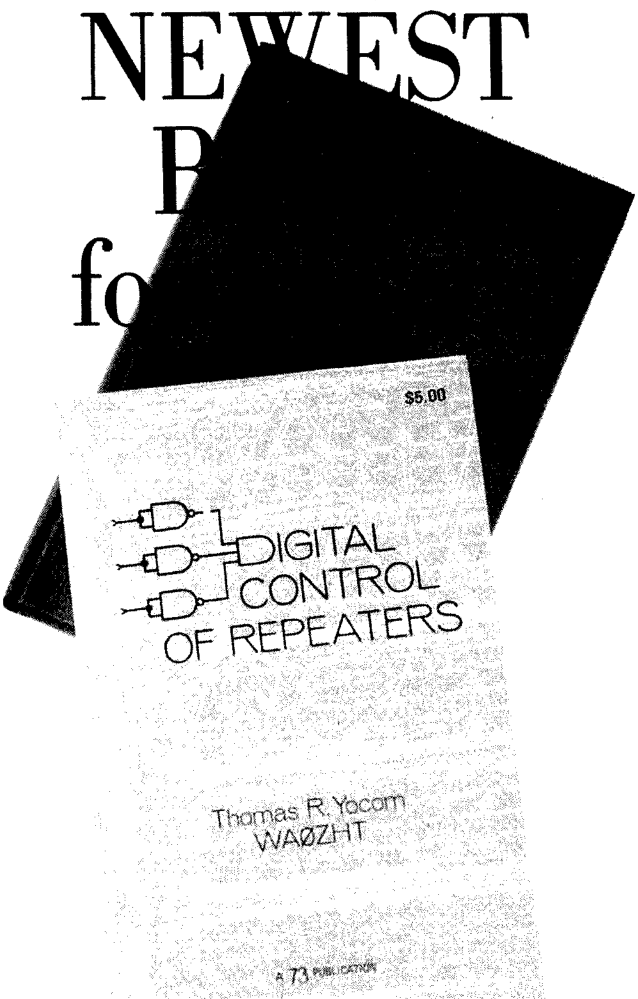


Fig. 1.



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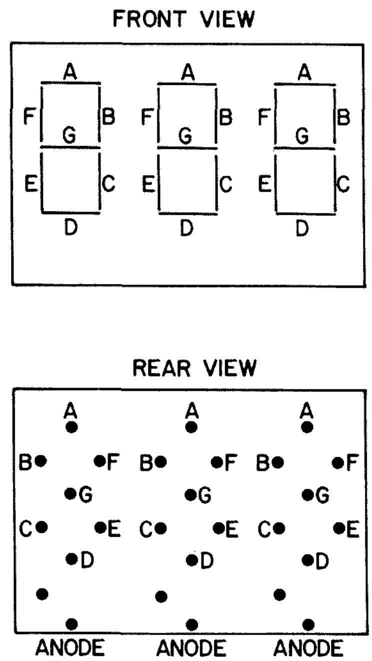

Fig. 2. SP-733 pin numbers.

the diodes in the matrix varies from 10–15V with a 200V potential on the SP-733's. Another garden variety of silicon diode that may be used are those that are sold by Radio Shack in packs of 50. These are untested and should be checked before placing them in the matrix. We found that usually one out of the 50 would be shorted or open.

Figure 1 illustrates the printed board construction. Our boards measure 5 x 7.5 cm and could have been made such smaller by standing the diodes on end. Use double sided PC board stock (copper plated on both sides) and follow the Fig. 1 pattern. The solid lines indicate top side conductor lines and the dotted indicate bottom conductors.

The easiest way to drill the double sided board so that the holes match after etching is to hold the board up to a lamp so that the bottom lines show through the board. Mark your drill hole positions with a pencil and then drill. Figure 2 illustrates the SP-733 segment pin connections.

The completed diode matrix units are thin and can be easily stacked in a small area.

Do not hesitate to experiment with different types of silicon diodes. Almost any high speed switching type of diode will function.

. . .W2AOO

(Continued from page 7)

privileges in the first place.

On the other hand, CBers are not required to do anything more than to file an application plus the required fee. In many cases it has been shown that these applications have been and are being falsified. It has been a very common practice for persons to sign for others, often offspring whose insufficient years would disqualify them. A person who signs such a false application is guilty of a serious crime; that of attesting to untrue statements, to wit: that he (the signator) is applying for operating privileges, when in reality he is filing for an individual who is not eligible. Through this means an out-and-out example of lawless behavior on the part of his parent or other adult is the juvenile's initial impression regarding the relative unimportance of observing the communication laws and obeying them. This is a compelling impression which often molds and sets his conduct from that time forward. If the adult in question has been able to falsify the application document with such ease, why should the recipient of the license view legal operating regulations with any respect?

This lamentable condition which has always infected the Citizens Band, is a direct outgrowth of the FCC's utter failure to understand that they must insist upon more than just the mere filing of an application, with absolutely no further qualifying criteria. Though it is entirely possible for administrative miscalculations to occur when new modes or services are first inaugurated, to fail to take forceful corrective measures when the error is discovered, is a monumental dereliction of responsibility. CB, with all its evils and problems, is the creature of the FCC, and they cannot blame anyone for the mess but themselves. Why then, should we amateurs be made to pay for the mistake? We paid dearly once, with the loss of one of our bands. Are we expected to pay all over again, simply because the FCC refuses to acknowledge that CB has been a miserable fiasco? Why don't they move the CBers to somebody else's band, rather than to yet another ham band?

A long time ago this correspondent suggested in the pages of this magazine that if the FCC was truly interested in some constructive suggestions, one of the very best would be the granting of CW privileges somewhere on the HF bands for the Technicians so that those who might desire to upgrade their tickets would be afforded an opportunity to do so with more ease. The Commission evidently recognized no merit in this proposal although it was no secret that many Techs were far more interested in becoming communicators than in being builders and experimenters, (for which purpose the Tech class was originally established). As it now stands, Techs have to struggle in order to get enough code under their belts to handle the required speed and facility.

At one point an ill-advised proposal was made which would have granted Techs phone privileges only in the 28 MHz band, but no CW was included. LEAKY LINES opposed this on the basis that such a free grant, with no code exam involved, would amount to an unconscionable breach of faith with those who had been forced to accept the validity of the incentive licensing principle, which had previously been piously pushed by both the FCC and the ARRL, under the pretext that it was altogether proper for amateurs to justify their privilege by continuing to advance their skills under pain of (again. . .it seems to rear its head as a solution for every problem. .) under pain, as I said, of a loss of operating frequencies! Most hams were so thoroughly brainwashed and so battered from pillar to post, that they finally concurred and accepted the doctrine of incentive licensing. Fine! But at the time when it was proposed that this hanky-panky about giving the Techs a back-door entrance into privileges on 29.5-29.7 MHz, most of us were of the opinion that such a grant would have been an abrogation of the incentive licensing principle, and would have afforded unfair preferential favor to the disadvantage of all who had been forced into working hard enough to upgrade.

Literally hordes of Technicians wrote indignant protests to this magazine, accusing this writer of prejudice, unfairness and a score of other selfish motives. It was claimed that the article was aimed solely at slamming the door of equal opportunity in the faces of Technicians. Well, of course, that door has always been possible to open. Thousands of Techs had successfully upgraded their license through the ordinary process of studying their code and theory, then going to an FCC examining point and passing the test. We simply happened to feel strongly that any Tech who really felt the desire to extend his operating privileges could easily do so by exerting himself to that limited extent, and if he was unwilling to exert this small effort, he certainly did not deserve preferential treatment. We termed the proposal "giving a lollipop to a kid at the barber shop."

I can state confidently that if the FCC had offered CW privileges only to the Techs, either as a shared proposition with the Novices, or on some other segment of the HF bands, there are not many hams who would have objected to it. It has always seemed incomprehensible to this writer that the FCC has not seen fit to provide some CW space for the express purpose of aiding Techs who wished to upgrade themselves by participating in on-the-air CW operation. The present CW privilege they are assigned simply has an insufficient number of CW operators to be considered adequate.

Having failed to perceive any validity in adopting this and other reasonable plans that would effectively improve and consolidate the amateur service, one wonders by what manner of "double-think" the FCC finds merit in a proposal to hand CB another portion of the spectrum on a silver platter, which it will undoubtedly destroy, just as they destroyed their present band. There is not a scintilla of reasonable evidence to show that a relocation to the 220 MHz band would cause them to mend their ways and begin to observe regulations which they have never before heeded. . .do not observe now. . .and are not even remotely taking seriously.

Another criticism can be levelled. In a country in which financial profit is the name of the game, it would be extremely naive to imagine that such a proposal could grow out of the sole idea that it would really be meritorious from the aspect of valid need. We all know whose brainstorm this proposal was. . .there is no doubt that it was spawned by the manufacturers of electronic equipment, who stand to reap millions in windfall profits, should the proposal be approved. The very moment it becomes okayed, sales of new equipment will begin to burgeon, and the enormous sales figures which ensue are likely to make the old CB business look like penny-ante stuff! In order to avoid being misunderstood, let's get this clear, at least. I certainly do not begrudge manufacturers their right to build and sell gear. But it seems that in this case it was the main object in proposing the change. And while the economic aim may be perfectly acceptable, I think the loss of an amateur band is much too high a price for us to be forced to pay! If this change were motivated primarily for the purpose of improving and benefiting the radio spectrum, then secondarily, for assisting the electronics industry to reap a harvest, then the proposal might be viewed as acceptable by some. But the move is advantageous to manufacturers and the CBers alone. The amateurs stand

(Continued on page 98)

(Continued from page 12)

FCC HEARING REPORT

Copies of the three page report made to the FCC Commissioners on the need for repeal of the repeater regulations are available from 73 Magazine, Peterborough NH 03458 . . . send sase. Many amateurs who are not well informed on the seriousness of the impact of the new regulations would do well to read this report and see why it is so important that these regs be changed.

CONGRESS REPORT

There are still copies of the Congress Newsletter – a report written for you to send along to your Senator or Congressman, together with a covering letter, asking for his influence in helping amateur radio fight off the new restrictive regulations and the assaults on our 220 and 450 MHz bands.

73 VS IRS

The first of a series of newsletters covering this interesting development is in print and available if you send a sase. If there is enough interest in the inside dope on the IRS and the whole tax situation, this series of letters will eventually be put into book form. Looking into the administration of the IRS has turned out to be about like turning over an innocent looking log and finding all sorts of scrambling maggots and black beetles scurrying around.

SUPERLICENSED

A note from WA5CON suggests some sort of special amateur call prefix for ops who have managed to pass all FCC exams. Ticket collectors will have a tough job keeping up with this chap who now has first phone with radar endorsement, first telegraph with radar, six months maritime service endorsement, aircraft telegraph, and amateur extra class. With all those licenses on the wall is there any room for QSL cards? And howdo you decide which band to use when you have a spare moment between tests?

WANTS TO BUY
All types of military electronics equipment and parts. Call collect for cash offer.

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(Continued from page 97)

only to lose still another slice of frequency. And what will we gain? Precisely nothing!

"But listen," say the proponents of the grab. "This particular band is not even being used." They try to argue that the idle frequencies should be re-assigned to people who will make better use of them. We once made an analogy. . .supposing you are storing your winter overcoat in a cedar closet. All of a sudden, in the middle of July, some guy waltzes in and takes your overcoat away, using as justification the argument that you aren't using it. You'd surely feel a sense of outrage. And rightly so! This rationale is as cockeyed as it can be. The coat is stored in the closet to be used at some later time, when conditions warraant. Similarly, the 220 MHz band seems likely to become more important to amateurs *in the future* because of the rapid growth of VHF repeater techniques. It could easily become one of ham radio's most valuable assets. Like the overcoat in the closet, it will serve its purpose in due course. It would be a tragic error to hand it over without a struggle to opportunists who will make it a shambles, and to entrepreneurs who will profit by the misuse.

While I'm on the subject of repeaters, a haunting thought races through my head. Could it possibly be that the FCC, anticipating the advancing repeater technology, and realizing that sooner or later it must inevitably become indispensable to 220 MHz, has chosen to implement its idiotic and totally illogical position vis-a-vis the Docket which pertains to repeaters, in order to create the fundamental structure within whose framework it can maintain the condition of disuse on that band? In this manner the Commission could almost guarantee that when the proper time came along, and it decided to reassign 220 to another service, it could point to the fact that amateurs are not utilizing it, and that therefore it would be a justifiable reassignment. In these days of elaboroate finagling on the part of government agencies and bureaus, and all sorts of conspiracies and coverups, this sort of a cabalistic arrangement would not be as bizarre and arcane as it appears on the surface. We could very easily find ourselves right smack dab in the middle of our own little Watergate.

I'm perfectly willing to grant the fact that in the beginning, back in the 40's when it was first proposed, CB sounded like a reasonably good idea. And I'm further willing to agree that there are many legitimate users of that service who need and deserve a band of frequencies in which to operate. But *never*, from the outset, was a hobby-type operation envisioned or contemplated. Amateur radio has existed for that purpose, and it has always been available for those who were interested from a hobby standpoint. To change our fundamental understanding now, and take the position that radio communications are two hobbies. . .one, a group of technically minded devotees of an ongoing science, who are vitally concerned with being a part of its growth. . .and two, a group of unconcerned dilletantes whose only purpose is to contact one another in a sort of surrogate wireless telephone system, without the slightest inclination to probe into the theoretical and the public service aspects of the thing, is an abrogation of a concept which has earned the respect and confidence of all thoughtful people, throughout the world. No matter how the FCC seeks to rationalize this projected change, it can never explain away the horrid inconsistency embodied in the very character and nature of the idea. On the one hand it licenses a service which has always risen to every challenge, and has justified its existence by participating in thousands of public service activities. On the other hand it has created a mare's nest. . .a Pandora's Box of atrocious horrors, which has never abided by the concepts which gave it life, has created problems of its own, and which constitutes an insoluble mess so vile that nobody can decide what can be done to clear it up! Then they have the unutterable gall to suggest that this cancer must be allowed to spread to another part of the spectrum.

Citizens Band has been a failure on 27 MHz. Wherever they chose to put it, it will continue to be a fiasco, unless they stiffen the requirements and begin to enforce some adult responsibility onto the shoulders of these freeloading parasites who have corrupted it. They must be made accountable, finally, for their undisciplined excesses. But this can never happen so long as a naive Federal Communications Commission continues to believe in the preposterous notion that the present form of loose criteria in licensing and operational regulations and enforcement should be maintained.

It's a certainty that this proposal represents a giant step backward for the world of amateur radio. And every ham should be aware of his or her solemn obligation to make known to the Commission exactly how he or she feels about the matter. This one issue is probably the most important single piece of legislative action an amateur can take, providing his hobby means anything at all to him.

73 de K2AGZ

LETTERS

RE: DECEMBER COVER

The December cover with Linda makes an attractive presentation to the public as well as to us "old timers." Such an idea put into a monthly calendar would increase the DXing. You all are to be complimented for an attractive cover done in fine taste.

Art Greenleaf WA1EQI
Montpelier VT

NO MORE COVER-UPS

You've done it again – a terrific cover and a terrific package of articles and ads!

I'm game! She's a beautiful gal and what is behind the box is most tantalyzing! Here's my $3, and if you only get $1 of it you'll be a millionaire over night. In some future issue you might tell us just how close to a million you came!

Lon Allbright W6SLF

MORE ON THE COVER

Your November 73 cover is in very poor taste, but does indicate the mentality of the Staff of 73.

Although I am not in agreement with Mr. Walker in many instances, amateur magazines are not the place for your kind of politics.

Jo Wood W1AYG

I do wonder where you think the place is for amateur radio politics if not in the ham magazines? Perhaps you are used to letting the government trod you into the ground and wish to just give up without a fight, whether you are right or not. Thank heavens not all amateurs are that willing to knuckle under.

. . .wayne

MORE OFF THE COVER

Enclosed is the $3 I'm willing to pay to see what's behind the PACKAGE. Also, I hope it helps build up your anti-IRS fund. If needed I'll pay newsstand prices for your magazine just to keep you going. Keep up the good work.

Al B. Caplan K4AVQ/3

D DEC ENTRY BOFFO

I Bravo! Now *that's* a magazine cover.

Bob Wier WBØIMC/5
Fort Worth TX

DIGITAL IC ARTICLES WANTED

How about some articles on digital IC's and their basic operations? Maybe how counters work, how to use a diode memory for generating code for an automatic identifier (The ARRL FM and Repeater Handbook is poor in this area). Also, maybe an article on capture area, antenna gain, and how they're related (I haven't been able to find anything on this). Maybe an article on regulated power supplies (transistor) too.

Keep up the good work on the magazine.

Jim Kocsis WA9PYH
South Bend IN 46628

ADDITIONAL CALCULATOR ARTICLES WANTED

Enjoyed very much the article in the December issue on Calculators. I would like more articles on the same subject, e. g., checking out a machine, how to tell if it is defective, etc.

Jo Westheimer WB6KUC

GOOD WORK

Keep the presses rolling, your magazine is not only good reading but has convinced several friends to put down the CB rig and start reading the license manual. Keep up the good work.

Mike Makowski WA1QMK/3
Arnold MA

CONGRESS PAPER

Please send me the Congress Paper. I will forward them to my Senator, as soon as I receive them.

Hopefully a large percentage of the amateurs will do the same.

You have a very fine magazine, keep up the fine articles. Lots of luck to Wayne in his battle with the IRS.

David W. Jubb WA7KAI

CBers TAKE NOTE

The FCC *does* take action on tips against CBers. I have been listening and logging about 15-30 minutes a day on 11m since February 1973. Recently I identified by "handle" (pseudonym), address, auto license number and name 31 good old CBers. I sent my information to the Commission and have since heard from them. Guess where their mobile enforcement unit is going to strike soon?

Joe Schlatter K4FPT/7
Tucson AZ

IRS/FCC KEEP UP THE FIGHT

I appreciated your rambling dissertaion on the perils of the IRS – keep up the fight. I also appreciated your work in fighting the FCC and in keeping us posted on the latest.

Lewis L. Munn
Roseville MN

we goofed again

LOG-PERIODIC UPDATE

There is one item regarding the construction of L-Ps (September 73) which should be stressed. This is the importance of *transposing* between the elements to make it an end-fire array.

This is accomplished by either of two methods: 1. "Criss-Cross" or "roll over" the two-wire center feeder, between elements (180° phase reversal), or, 2. Alternately transpose the feed to the elements.

I have illustrated both methods in my articles but have evidently failed to stress the importance of this.

I have received two letters stating that the writers had constructed L-Ps but did not get any forward gain, or rather there appeared to be no forward lobe. One writer who put up a vertical mono-pole L-P said it was bi-directional off the sides with no gain off the front. This, of course, occurs if the transposition is not made since the array is not then an end-fir L-P, but is a bi-directional broadside array since all elements are then in phase.

In the case of a horizontal (dipole type) L-P, maximum radiation would be straight up and straight down (into the ground) if the elements are in phase or are non-transposed. There would be no forward lobe, nor would there be any gain except straight up. Under this condition the antenna is *not a Log-Periodic* but is merely the old "fishbone" antenna.

F. E. Smith W4AEO
Camden SC

and again . . .

CALCULATOR CORRECTIONS

Here are some corrections to my December 73 Calculator article:

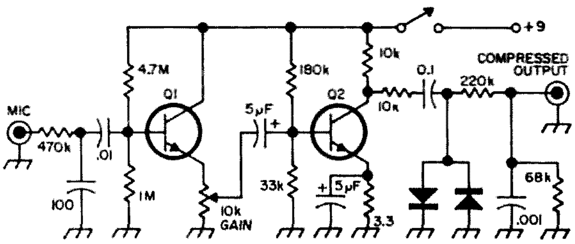
p. 98, 2nd col., line 25: $.010 should be $0.10.
p. 102, 2nd col., line 8: 0.001 second should be 0.0001 second.
p. 102, 2nd col., line 28: 552.85957 should be 552.861277.
p. 105: In the two tables, the lefthand column has a number of duplications. Whenever two consecutive lines have the same text in column 1, cross out the text in this column on the second line of each pair.
p. 106, 2nd col., line 4: should read, ". . .is 2.718055, whereas it is supposed to be 2.7182818.

Peter A. Stark K2OAW
Mt. Kisco NY

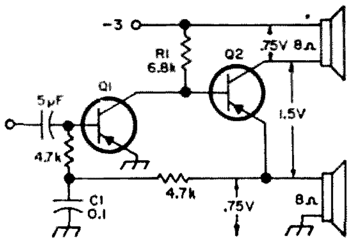
CIRCUITS, CIRCUITS, CIRCUITS...

The following circuits have appeared in the referenced books, magazines, application notes, etc. While we try to reproduce all of the information that should be needed by an experienced constructor, readers may want to avail themselves of the original sources for peace of mind.

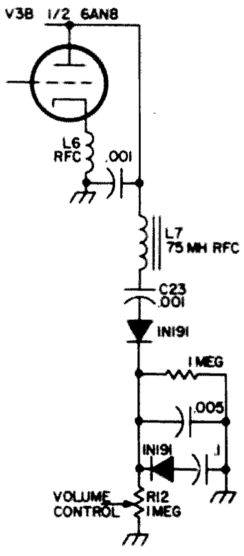
Readers are requested to pass along any interesting circuits that they discover in sources other than U.S. ham magazines. Circuits should be oriented toward amateur radio and experimentation rather than industrial or computer technology. Submit circuit with all parts values on it, a very brief explanation of the circuit and any additional parts information required, give the source and a note of permission to reprint from the copyright holder, if any, and the reward for a published circuit will be a choice of a 73 book. Send your circuits to 73 Circuits Page, 73 Magazine, Peterborough NH 03458.



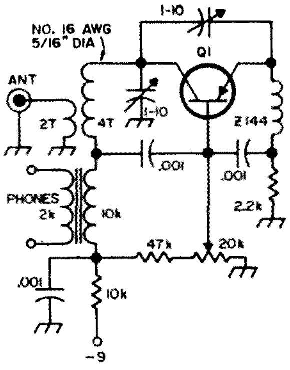
Two stage clipper/preamp will increase the talk power of your rig. Transistors Q1 and Q2 are HEP-54. The diodes are IN456 or HEP-158.



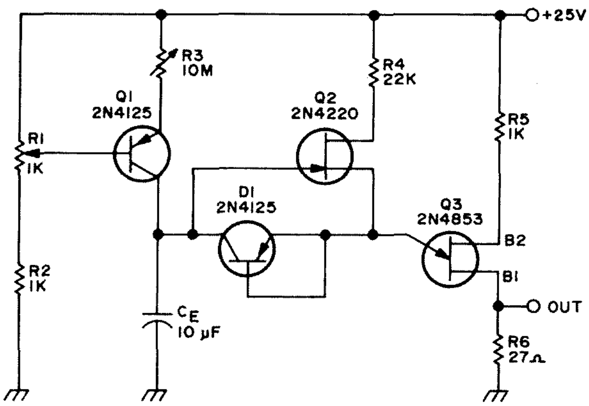
An audio power amplifier with push pull output using a single transistor in the final stage may be obtained with this simple circuit. Only about 50 mW is available from this amplifier, but the gain is flat up to 30 kHz. Both Q1 and Q2 should be germanium audio transistors such as the 2N404, SK3004 or HEP-253.



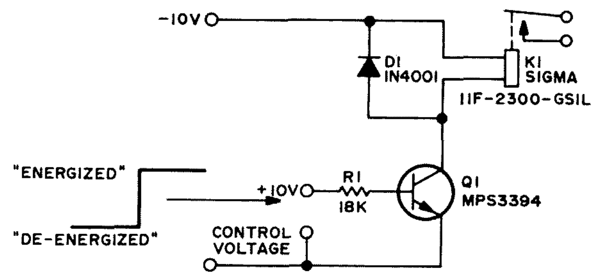
A simple noise limiter that can be used with superregen detectors similar to those in the Two'er and Six'er.



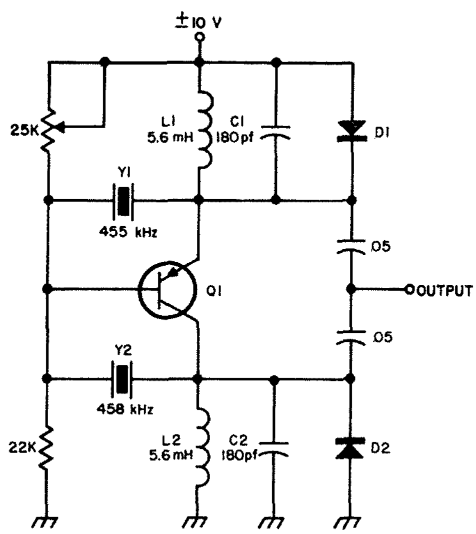
This simple one transistor superregenerative receiver for two meters may be used for copying many local signals. With the components shown this receiver will tune from about 90 to 150 MHz. It may be used on other frequencies by changing the inductor and capacitor Q1 is a GE-9 or HEP-2.



Long duration FET timer which will give a delay up to 10 hours. Circuit courtesy Motorola Semiconductor Power Circuits Handbook.

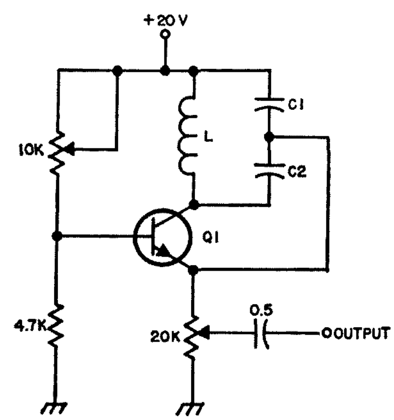


Electronic control of a dc relay. Circuit courtesy Motorola Semiconductor Power Circuits Handbook.



Q1- 2N384, 2N525, SK3004, TI-XM03
D1,D2- GENERAL PURPOSE SILICON DIODES

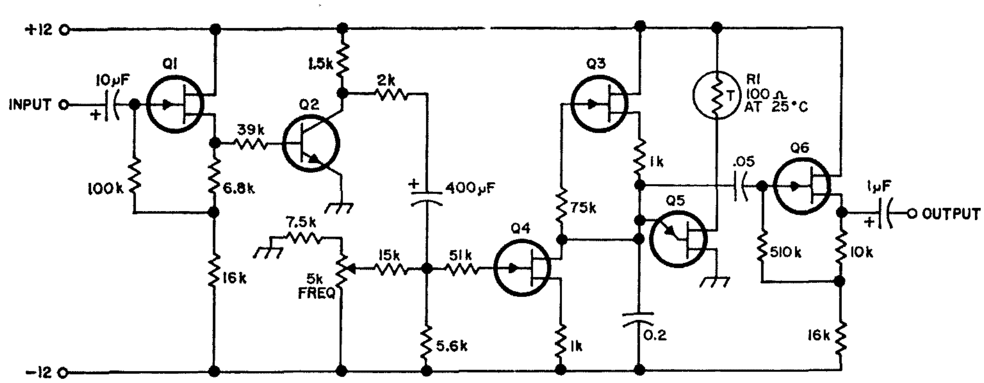
This two frequency crystal oscillator changes frequency by simply reversing the supply voltage. When the supply voltage is changed, the transistor inverts itself; usually transistors may not be used in the inverted mode, but in an oscillator a gain of only 1 or 2 is needed and this circuit provides a novel and simple way of obtaining two frequencies from a single stage with a minimum of switching.



Q1 - 2N2925, 2N3392

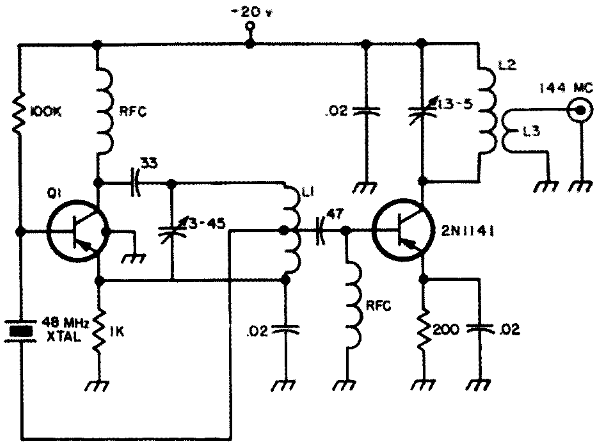
FREQUENCY	C1	C2	L
50 kHz	3500 pf	1500 pf	10 mH
80 kHz	2200 pf	910 pf	6.2 mH
100 kHz	1800 pf	750 pf	4.7 mH
200 kHz	910 pf	390 pf	2.2 mH
455 kHz	390 pf	160 pf	1 mH
1000 kHz	180 pf	75 pf	0.47 mH

This simple circuit provides an extremely stable BFO. The frequency of oscillation may be tailored to your needs by simply choosing the proper tank componenents listed in the table.



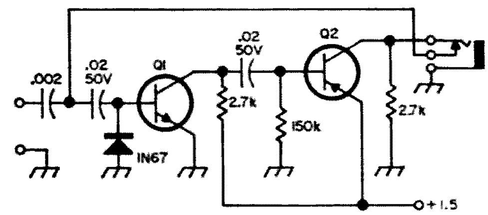
Although this capacitance meter will not measure electrolytic capacitors, it will measure any other type from zero to 0.1 µF with reasonable accuracy. On the lower and 4 pF can be read accurately and 2 pF easily estimated. Transistors Q1 and Q2 are 2N168, 2N1605, 2N2926, SK3011 or HEP-54; the meter is a 0-50 microampere unit and the range switch a Centralab PA1021.

MORE CIRCUITS . . .

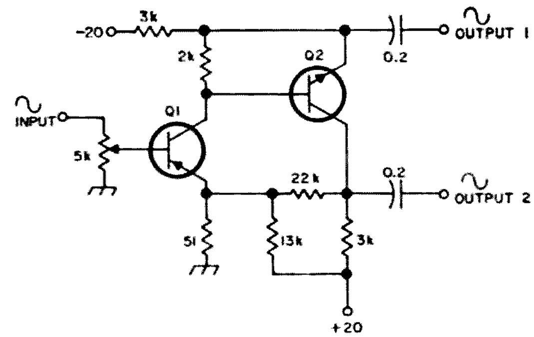


L1 8 TURNS B&W 3003 (16 TURNS PER INCH, 1/2" DIAM.) TAPPED AT 4 TURNS FROM COLD END.
L2 8 TURNS NO. 16, 5/16" DIAM, 1" LONG
L3 3 TURNS NO. 16 BIFILAR WOUND ON COLD END OF L2.
Q1 2N384, SK3008, TIXM03
RFC 1.8 µH (OHMITE Z-144)

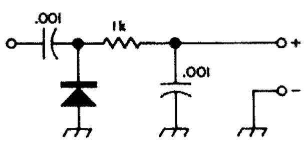
This simple two meter transmitter may be used as a driver for a larger 144 MHz transmitter or a signal source for testing receivers, converters and antennas.



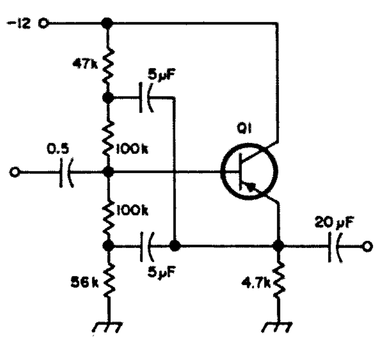
This signal injector/tracer switches from the injection mode to a signal tracer by simply plugging in a pair of high impedance magnetic earphones. As a tracer it works from audio up to 432 MHz. Transistor Q1 is a 2N170, 2N388A, 2N1605, SK3011 or GE-7; Q2 is a 2N188A, 2N404, 2N2953, SK3004 or HEP-253.



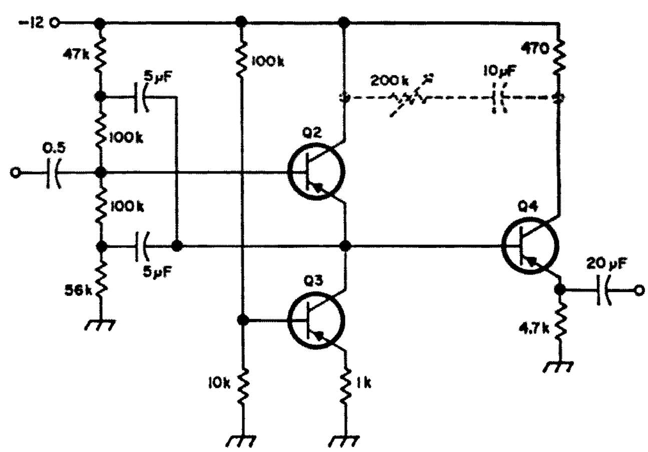
This phase splitting circuit provides two out of phase signals for driving a push pull amplifier without an expensive transformer. The gain of the stage as shown is 150, but this may be adjusted by changing the value of the 22K feedback resistor. Q1 and Q2 are a complimentary pair such as the 2N652 and 2N388 or 2N2430 and 2N2706.



A general-purpose rf detector probe for use with an oscilloscope or voltemeter.



(A)



(B)

This high impedance preamplifier provides up to 20 megohms input impedance and has a frequency response from 10 Hz to 220 kHz. Circuit B was developed from circuit A by replacing the emitter resistor in A with Q3 and adding an emitter follower to reduce loading. The input impedance is further increased by the components shown by the dashed line. All transistors are 2N2188, SK3005, GE-9 or HEP-2.

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					1	2
3	4	5	$\boxed{6}$	$\boxed{7}$	$\boxed{8}$	9
10	11	$\boxed{12}$	13	$\boxed{14}$	15	16
$\boxed{17}$	18	19	20	21	$\boxed{22}$	$\boxed{23}$
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EASTERN UNITED STATES TO:

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ALASKA	14	7	7	3	3	3	3	3	7	14	14	14A
ARGENTINA	14	7B	7B	7	7	7	14	21	21	21	21	21
AUSTRALIA	14A	14	7B	7B	7B	7	7	14	14	14B	14	21
CANAL ZONE	14	7	7	7	7	7	7A	21	21	21	21	21
ENGLAND	7	7	7	3	7	7	14	14A	14A	14	14	7
HAWAII	14A	14	7B	7	7	7	7	7	7B	14	21	21
INDIA	7	7	7B	7B	7B	7B	7B	14	14	7B	7B	7
JAPAN	14	7B	7B	7B	7	7	7	7	7	7B	7B	7
MEXICO	14	7	7	7	7	7	7	14	14A	21	14A	14
PHILIPPINES	14	7B	7B	7B	7B	3B	7	7	7	7B	7B	7B
PUERTO RICO	7A	7	7	7	7	7	7A	14	14	14	14	14
SOUTH AFRICA	7A	7	7	7	7B	7B	14	21	21	21	14A	14
U. S. S. R.	7	7	3	3	7	7B	14	14	14	7B	7B	7
WEST COAST	14	14	7	7	7	7	7	14	14	14A	21	14A

CENTRAL UNITED STATES TO:

ALASKA	14	14	7	3	3	3	3	3	7	14	14	14A
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AUSTRALIA	21	14	7B	7B	7B	7	7	7	7	14B	14	21
CANAL ZONE	14A	14	7	7	7	7	7	14A	21	21	21	21
ENGLAND	7	7	7	3	7	3	7B	14	14A	14	7B	7
HAWAII	21	14	7B	7	7	7	7	7	7B	14	21	21
INDIA	7	7	7B	7B	7B	7B	3B	7	7A	7	7B	7B
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MEXICO	14	7	7	3A	7	3	3	7	14	14	14	14
PHILIPPINES	14	14	7B	7B	3B	7B	7	7	7	7	7B	7B
PUERTO RICO	14	7	7	7	7	7	7	14	14A	14A	14	14
SOUTH AFRICA	14B	7	7	7	7B	7B	7B	14	21	21	14A	14
U. S. S. R.	7	3	3	3	7	7	7B	7A	14	7B	7B	7B

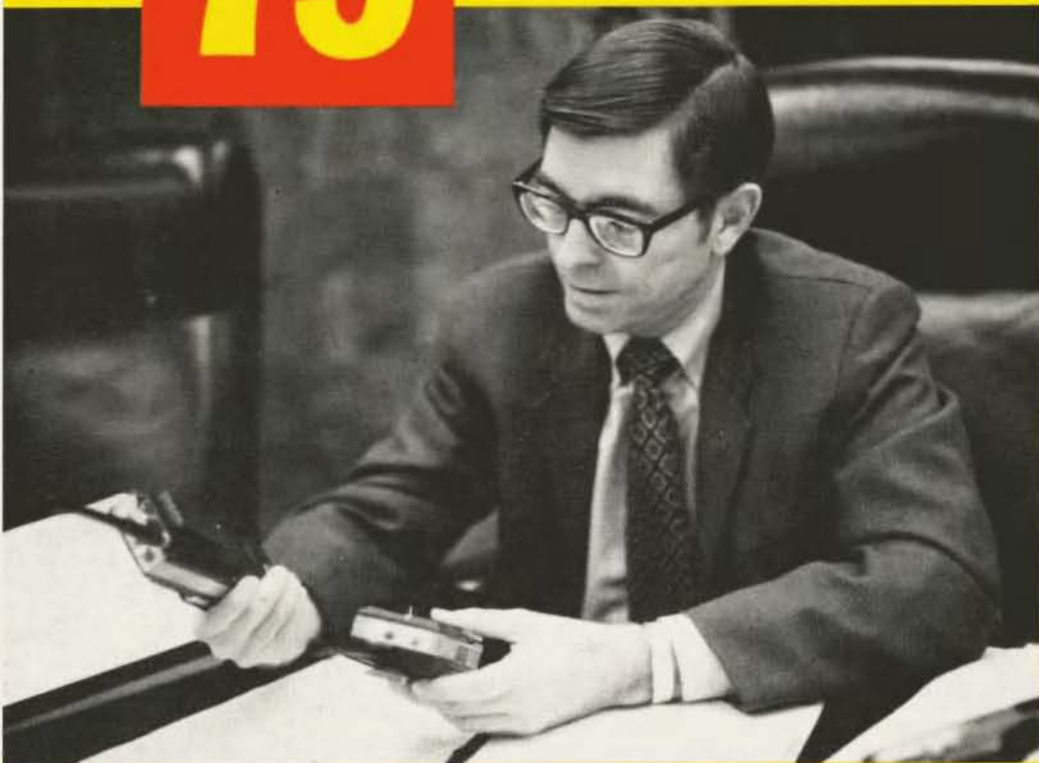
WESTERN UNITED STATES TO:

ALASKA	14	14	7	3	3	3	3	3	7	14	14	14
ARGENTINA	21	14	7B	7	7	7	7	14	21	21	21	21
AUSTRALIA	21	21	14	7B	7	7	7	7	7	7B	14	21
CANAL ZONE	14A	14	7	7	7	7	7	14	21	21	21	21
ENGLAND	7	7	7	3	7	7	3B	7B	14	14	7B	7B
HAWAII	21A	21	14	7	7	7	7	3A	7	14	21	21
INDIA	7B	14	14B	3B	3B	3B	3B	3A	7	7	7B	7B
JAPAN	21	14	14	7	7	7	7	3	7	7	7B	14
MEXICO	14	14	7	7	7	7	7	7	14	14A	14A	14
PHILIPPINES	21	14	14	7B	3B	7B	7B	3A	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7	14	14A	21	21	14A
SOUTH AFRICA	14B	7	7	7	7B	7B	7B	7B	14	14A	14A	14
U. S. S. R.	7	7	3	3	3	7	7	7	7A	7B	7B	7B
EAST COAST	14	14	7	7	7	7	7	14	14,	14A	21	14A

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

$1.00
March 1974

73 magazine
for radio amateurs



FCC Commissioner Wiley examines HT's . . . details inside.

Repeater Councils Get FCC Hearing

Major Rules Change Announced !!!

W2NSD

W2ODC

W2EUP

WB2EIL

K4ROZ

K6VGP

WB6MFA

WØNAZ

WAØIDO

W Ø WO

WB8HFE

73 magazine
for radio amateurs

162 MARCH 1974

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COVER: Commissioner Wiley, who took a particular interest in the problems of amateur radio. . .and the ad hoc committee representing repeater councils from coast to coast which testified before the FCC Hearing on January 14th. The hearing was organized and moderated by Wayne Green W2NSD/1.

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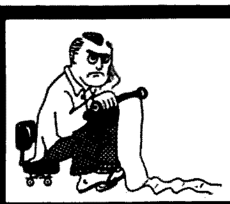


NEVER SAY DIE

...de W2NSD/1

EDITORIAL BY WAYNE GREEN

FCC HEARS AMATEUR PLEA!

The reaction of amateurs and repeater groups to the new rules for repeaters released in 1972 under the heading of Docket 18803 was so vigorous that it eventually resulted in a precedent shattering hearing before the full Commission!

When Docket 18803 was originally proposed in 1970 the amateur reaction was immediate and vigorous. The then Chief of the Amateur Division decided that the proposals were unworkable and that a completely new docket would have to be devised, one which would be more in line with the FM scene as it was at that time. The proposal for repeater rules had been kicking around for years and was hopelessly out of date in 1970.

The old Chief of the Amateur Division retired and was replaced by Walker and most repeater groups expected the new shuffle to materialize on the proposed rules. Consternation was the order of the day when Docket 18803 suddenly was enacted. The repeater groups could hardly believe what they saw, the rules were so incredible and so unrealistic, "Assinine," was the comment of ARRL spokesman McCoy, the League's FM "expert."

The first reaction was a flood of petitions and letters, all asking for mercy. The second blow was when the Commission announced that every petition, without exception, had been summarily denied. It was reliably reported that this was done by the Commission at the request of Walker to try and save him the embarassment of admitting that his work on the rules had been faulty.

Walker went even further at Rochester where he told the amateurs there in a speech that any further petitions for Docket 18803 rule changes would be thrown out since that matter had already been completely considered. What could amateurs do next?

The alarm of the repeater groups turned out to be valid. Amateurs have always prided themselves on their ability to be self-policing and on being the best behaved service under the FCC. Suddenly several responsible groups of amateurs decided that the rules were so unfair and inequitable that they would ignore those which were most odious and which were senseless to them.

The FCC bogged down almost totally under the burden of repeater applications so that extension after extension had to be granted to the impractical deadlines set in the docket. The new rules were so complicated and demanding that, even with all the guidance 73 and QST could provide, over 90% of the applications were rejected. With rule and application interpretations changing every few days, and with the embarassment of this debacle becoming more apparent daily, less and less information became available from the Commission to the magazines.

CONGRESS ALERTED
TAPES AVAILABLE

With all approaches to the FCC seemingly closed down, amateurs turned to Congress for help. Dozens of amateurs sent in for copies of the 73 letter to Congress which explained about the value of amateur radio, what repeaters are, and the difficulty with the repeater regulations. These were sent, together with covering letters, to their Congressmen and Senators. The Commission, being sensitive to such pressures, responded favorably.

A special hearing was set up for January 14th for the Commissioners to be presented with a report on the repeater regulations and the reasons why they are restrictive and should be changed. A synopsis of the material to be covered during the hearing was prepared by Wayne Green and sent, along with copies of over 3000 signatures requesting a reopening of Docket 18803, to the Commissioners.

The hearing before the Commissioners on the need for changing the repeater regulations is a first. Never before has an amateur radio group been able to appeal to the Commission en banc for changes in the rules. Of course, never before has there been such a unanimity of purpose among amateurs that rules needed changing.

Representatives of repeater councils of California, Colorado, Wyoming, Michigan, Georgia, Western New York, Greater New York City, Missouri, Eastern New York and New England attended and testified. A tape was made of the hearing and that is available from 73 Magazine, Peterborough NH 03458 on a 90-minute cassette for $5. The tape came out quite well. It makes for interesting listening. The 90-minutes is a little long for a single club meeting, but it might be split in half for two meetings. It's a little long for a few of the repeater timers, but that is surmountable.

The Commissioners not only were interested in the proceeding, but responded with good questions and indicated a sympathetic attitude. They asked that the hearing be followed up with new petitions for rule changes. This was the result that everyone had hoped for.

FREEDOM WAS THE GIST

The main thrust of the testimony before the Commission was that amateurs should be free to invent, to experiment, and to be self-regulating. The example of the repeater councils was given to demonstrate that amateurs are able to set up their own sub-bands and even coordinate frequencies for channelized operation.

Good cases were made for relaxing the monitoring restrictions, the subband frequency restrictions, the crossbanding restrictions, linking of repeater restrictions, ten meter repeater restrictions, and such. None of these restrictions are needed and all tend to inhibit amateur ingenuity.

If any serious results had resulted from the freedom that repeater groups had before Docket 18803, then some of the new rules might make more sense, but the fact was that difficulties were individual and isolated, being by far the exception to the normal. A sense of perspective seemed to be missing. Just because one New York repeater had a CBer raising hell with it for a few days and a Chicago repeater had a musician giving the boys music until he was routed out is hardly enough reason for making over a thousand repeaters monitor 24 hours a day to prevent a repetition of these outrages.

One result of over-reacting like that will be that amateurs will shut the FCC off from communication and not let them know about little problems in fear of future over-reaction. It is possible that a Midcars complaint to the FCC about interference to their net by unidentified stations could trigger off a rule that every transmitter in the amateur service be equipped with a builtin automatic identifier, like a repeater, thus killing the flea with a sledgehammer.

Marty WB6MFA, Dick K6VGP, Mike WB2EIL, Bert WAØIDQ, Marshall WBØHWQ.

VISUAL AID

Bert Reuler undertook to testify on the restrictiveness of the rules regarding portable repeaters and his exhibit was a complete repeater in an attache case! It was self-powered, with duplexer, and had a little antenna that stuck out the side of the case.

The main theme of the testimony regarding emergency service by amateurs was that the present Commission concept of amateurs setting up a system for a specific emergency is unworkable. The *only* reliable emergency system is one that is in constant use. Anyone who has worked with repeaters knows that repeater dependability means work, work and more work.

It is probably true that the present rules, which do permit the testing of emergency repeaters, could be interpreted as permitting a test of, say, ten years. One problem with this is that eventually some hard nosed amateur will come along and demand that the FCC define their terms and louse it up.

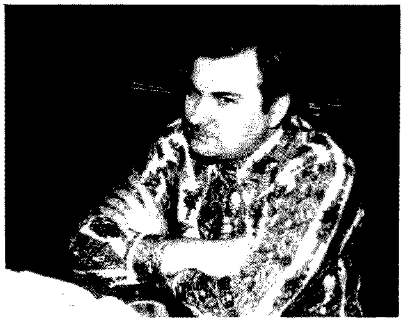
The same approach could be used to set up multiple repeater links. The rule (97.89-3c) does allow "brief periods to conduct emergency preparedness tests." A test of much less than several years on any emergency system would very unlikely be inconclusive, and would certainly be considered "brief" by most repeater groups.

COMMISSIONER WILEY WITH HT

The highly modified HT-100 of Dick McKay, complete with miniature touchtone pad, brought an enthusiastic response from FCC Commissioner Wiley at the recent hearing. The conversion of the unit was described in the November issue of 73.

It now appears that if the repeater councils are able to get together and convince the Commission that they have matters under control that it will be possible for many, if not all, of the restrictions on repeaters to be lifted.

HAM DEALER TESTIFIES



One of the council representatives at the recent hearing before the FCC in Washington was Henry Ruh WB8HEE of Communications Unlimited. You've probably seen Henry's ads for video tape equipment in 73 Magazine. He's been doing a first rate job of selling VTR equipment to radio amateurs. Never before has equipment been available at such reasonable prices, so few amateurs have had the opportunity to get involved with VTRs. This equipment, available at bargain prices, has been most helpful to the amateur television experimenters.

Henry represented the Michigan Repeater Council at the FCC hearing and helped put over the case that amateurs have been over-regulated.

COMMISSION RESPONSIVE

At the conclusion of the presentation the Commissioners indicated that they were interested in new petitions for changing the repeater rules. Marty Barrack WB6MFA, was chosen by the group to prepare the petitions to eliminate the restrictions. The group had, during the planning sessions preparatory to the hearing, gone over the rules and agreed upon the desired changes.

The group met again in the afternoon of the hearing day with Charley Higginbotham, the Chief of the Safety and Special Services, and the immediate superior to Walker. This turned out to be a very productive meeting. More meetings like that could have no other result than more realistic regulations for amateur radio. But how can you get representatives of amateur groups from all over the country to Washington for such meetings?

The need is for well informed amateurs to be available to work with the FCC on new rules – to answer their questions – to provide them with the information on how things really are in practice and to judge the effects of proposed rule changes. One proposal that seemed to have merit was some sort of periodic amateur conference where representatives of amateur clubs would meet and propose regulation changes to meet currrent amateur needs. This would be something like Congress, with committees reporting to the main body for the final votes. The ITU works like this. Such a plan would give radio clubs more of a stake in the running of amateur radio since they would be advising and funding their delegate to the conference.

LIBERTY LOBBY

After the hearing at the FCC I popped over to see the Liberty Lobby in Southeast Washington. This is a small and vigorous lobby which is fighting the government in many areas. Their stand on tax revolt interested me in particular. They have been distributing the Larson book, Tax Revolt USA, which is a corker ($5 from Liberty Lobby, 300 Independence Ave. SE, Washington 20003).

Liberty Lobby produces tape programs from a small studio in the cellar and pamphlets, newsletters and such from a few crowded offices upstairs. They keep close track of what is going on and get the information out to counter any trends which they feel are at odds with their philosophy.

They have a nice ham station set up there too and they use this to check into the Liberty Lobby net on Saturdays at 1:15 PM EDT on 14320 kHz.

Amateur radio doesn't need anything quite as big as the Liberty Lobby, but they do need an office in Washington with a staff of two or three dedicated amateurs to keep track of what is happening and get the word out. News of approaching FCC

Continued on page 102

CONTESTS

Tom DiBiase WB8KZD
708 6th Avenue
Steubenville OH 43952

Mar 9-11	Virginia QSO Party
Mar 9-10	Worldwide VHF Activity
Apr 12-14	Novice Contest
Apr 12-15	County Hunters SSB Contest
Apr 20-22	ZERO District QSO Party
May 11-13	Georgia QSO Party
May 18-20	Connecticut QSO Party

Virginia QSO Party

From 1800Z March 9 to 0200Z March 11, 1974. Phone & CW are part of the same contest. Stations may be worked once per band/mode. Virginia may work Virginia. Exchange signal report plus QSO number & QTH (Virginia county, state, province, or country). Score 1 pt. per QSO, Non-Virginia multiply by total Virginia counties, Virginia stations multiply by total QTHs worked (see QTH above). Frequencies: 3560, 7060, 14060, 21060, 28060 CW; 3930, 7230, 14285, 21375, 28575 SSB. Appropriate awards. LOGS – Indicate each new multiplier worked. Summary sheet and check list requested. Mail so as to be received no later than April 15, 1974. Send to Don Miles W4IML, 9801 Lomond Dr., Manassas VA 22110. SASE for results.

Worldwide VHF Activity

From 1500 local time March 9 to 2200 local time March 10. Bands are 6m, 2m, 1¼m. Exchange call letters, county, state and short ragchew. Each band will be scored separately. Stations may be worked once per band. To score for a given band, multiply total QSOs by total counties worked multiplied by total states worked. Show club call sign on log if club is working toward aggregate award. Two forms of competition – individual and aggregate. Many awards and certificates. No restrictions on using repeaters or any modes as long as legal. Send logs and SASE for awards by April 15, 1974 to WA3NUL, P. O. Box 1062, Hagerstown MD 21740.

Novice Contest

The International Novice Amateur Radio Association will hold its 1974 Novice QSO Party from Friday, April 12, 1800 GMT to Sunday, April 14, 1974, 0600 GMT. Group: any class amateur to work novice operators throughout the world. Exchange RST and handle. Work each station only once. Multiply total number of QSOs by the number of different prefixes worked. Appropriate awards for novice and non-novice operators. Send logs to Andi Anderson WB9FGM, RR #3, Box 85-26, Belvidere IL 61008 by May 1, 1974.

Connecticut QSO Party

2100 GMT May 18, to 0200 GMT May 20. Both CW and Phone permitted. Exchange QSO number, RST, ARRL Section for out of state stations, Connecticut County for Connecticut stations. Stations may be worked once on each band and also in each mode. Stations outside Connecticut multiply total number of QSOs by the number of Connecticut counties worked (maximum of 8). Connecticut stations multiply number of QSOs by number of ARRL sections or provinces. Suggested Frequencies: CW – 3540, 7040, 14040, 21040, 28040; Phone – 3925, 7250, 14300, 21375, 285480; Novice – 3725, 7125, 21125, 28125. Appropriate awards. A special WACC (Worked All Connecticut Counties) certificate will be awarded to each station, in or out of state, who works a station in each of the 8 Connecticut counties. Logs must be postmarked by June 20 and sent to: Candlewood Amateur Radio Association, c/o Donald Crosby W1EJM, 10 Royal Road, Danbury CN 06810. Send large SASE for results.

Results: 1973 Vermont QSO Party –

Top four out-of-state: K4YXJ, WA2PW/Ø, WA6PGB.

Top four Vermont: W1AYK, WA1KPJ, WA1GKS, W1FRT.

Results: 1973 Washington QSO Party –

Top four out-of-state: W5TWI, WA9GAM, K6WT, WB5IQG. (K6WT squeezed by WB5IQG by only 42 points to take third spot).

Top four Washington: W5QQQ/7, WA7RPI, K7NCG, K7UWT.

Results: 1973 CW County Hunters Contest –

High Score Fixed: WB4OGW.
High Score Portable: WAØTKJ/Ø.
Mobile: KØQIX/M.

Results: 1973 Georgia QSO Party –

Top seven out-of-state: K4VFY, WAØTKJ, K2VGR, W6PAA, K3HXS, WB4LHK, WA3PWL/Ø. (Closest race was for fifth with K3HXS topping WB4LHK by 30 points.)

Top seven Georgia: WB4UFW, K4BAI, K4TBN, W4YDN/4, W5YOX/M, K4FRM, WB4DBO.

(WB4UFW ended up with the amazing score of 132,770 points. This score topped that of K4BAI, (second place) by a margin of 63,218 points; however, there were 5 operators at WB4UFW, while K4BAI was all by himself.)

Results: 1973 Delaware QSO Party –

Top three out-of-state: W3GWA, WA6PGS, W9STW.

Top three Delaware: K3YHR, WA3PCC, K3KAJ.

DIAL TWISTERS CERTIFICATTE

The Spokane Dial Twisters ARC will have a "Dial Twisters Weekend" on March 9-10, to promote ham radio and help other hams acquire the prestigious and famous "Dial Twisters Certificate." Rules, times, dates and all that other good stuff can be had by dropping a line to: Tony Kjeldsen K7VNT, 223 East Bridgeport, Spokane WA 99207.

Hall of Science Award

The Hall of Science of New York, operates Amateur Radio Station WB2JSM as a public exhibit where visitors can see and participate in a station actually on the air.

An attractive, free, award certificate will be mailed to those amateur stations who work WB2JSM. WB2JSM is on the air daily except Mondays beginning at 10:00 AM EDT. On weekdays it is in operation until 2:00 PM, and in operation on Saturdays and Sundays until 5:00 PM. Frequencies worked are usually in the General portion of the bands with 20m and 15m the most used. All stations having previously participated can obtain the certificate on request noting QSO date to Box 1032, Flushing NY 11352.

Winnipeg Centennial Award

Mayor Stephen Juba and the Winnipeg Amateur Radio Club are pleased to offer *The City of Winnipeg Centennial Award*, in commemoration of the centennial of the city of Winnipeg, Canada in 1974. The certificate is in full color showing the Centennial symbol and is signed by Mayor Juba. This award replaces the *Worked All Winnipeg Award* for 1974. For operating requirements and further information contact: Winnipeg Amateur Radio Club Award, P.O. Box 352, Winnipeg, Manitoba, Canada.

WB8KZD

FCC NEWS

Amendment of Part 97 regarding the showings required with applications for repeater stations.

Adopted: January 10, 1974
Released: January 11, 1974

By the Commission

1. The purpose of this Order is to amend the rules for the Amateur Radio Service to change the requirement that certain technical data related to a repeater station be filed with the application for that station. The data now only need be entered in the station log. It will no longer be necessary to include the data with the repeater station application.
2. It is evident to us, from the experience gained in processing almost 500 applications for amateur repeater stations, amateurs have developed the knowledge and capability to properly determine the parameters of antenna height above average terrain and effective radiated power, in accordance with our rules. Therefore, data on these parameters are changed from application requirements in Section 97.41(f), to logging requirements in Section 97.111(f). This revised procedure will benefit applicants, since they will no longer need to include data with their applications. It will also benefit repeater station licensees, since they must no longer submit proposed changes to the Commission, before making modifications to their stations which would change these parameters. It will benefit the Commission, since it will not be necessary for us to review and approve data. Therefore, these amendments offer mutual benefits to amateurs and to the Commission.
3. In Section 97.108(a)(4), the word "automatically" is deleted from the requirement for provisions to limit the transmissions from a remotely controlled station in the event of a malfunction in the control link. The purpose of the requirement is to have a backup method of terminating transmission. It is immaterial whether the method is automatic or manual, and many systems have been licensed that use backup shutdown methods that are more manual than they are automatic.
4. The words "as installed," which were contained in the deleted Section 97.41(f)(6), are not included in the new counterpart Section 97.111(f)(7). We have learned from our processing experience, it is overly difficult for most amateurs to determine radiation patterns of an antenna as installed. We feel this requirement can be deleted without seriously compromising the overall results.
5. The net effect of these amendments will be a reduction in the initial showings required for all repeater station applications, and the elimination of showings with applications for repeater stations not proposed for remote control or involving auxiliary link stations. Licensees will now be able to make modifications to their repeater stations, except for changes involving remote control or link aspects, without the need for prior Commission approval. Our processing is making headway licensing those applications already on file, and as a result of these amendments, we should have the backlog eliminated in a matter of weeks. Any station involving remote control or an auxiliary link will still be required to make the showings for applications and modifications required by the remaining paragraphs of Section 97.41.
*Also deleted is the requirement that contour gradations on topographic maps only be 50 feet.

INTRUDER CHASE

Jonathan Tara WB8DBN
16260 Greenfield
Detroit MI 48235

The Intruder Net started operation on February 6. Right now it is planned to be weekly on Wednesdays at 9:00 PM EDT (0200 GMT Thursdays) on 7275 kHz. If there is interest it will be expanded. There will certainly be some schedules set up through the net. Initially the net will be to inform hams about intruders, to distribute information about intruders, exchange information, etc. Eventually it is hoped that enough of the members will equip themselves with direction finding loops so that it can be used to pinpoint intruders.

I've gotten a lot of mail about jamming intruders, none of it against. (Of course I haven't brought it up before.) I stayed clear of this subject, because I thought there would be a lot of conflict over it, but it seems that most hams have no objection to jamming in one form or another.

According to K6KA, the VK hams are authorized to jam intruders. As soon as I find out more about this, I will submit a petition to the FCC modeled after the Australian law. VKs seem to be among the most active in combating intruders. Organized jamming of intruders could be quite effective since most of the intruders on the list are illegal because they are broadcasting to the Western Hemisphere. That means that we are *in* the target area. We can have several stations around the U.S. jamming the same frequency, as well as hitting all frequencies of a multi-frequency broadcast, such as Radio Moscow's. All in all, I think hams are capable of setting up a jamming network the VOA would envy.

Such jamming, of course, is now illegal, but it has been made legal in Australia, so why not here? Of course, safeguards would have to be built in to make sure that only illegal foreign stations were jammed, and only those which are causing trouble. It makes no sense to try to jam a broadcast aimed at Europe, or one that is S3. Perhaps the FCC could provide a list of stations it is permissable to jam. This all sounds like a pretty "dirty" thing for hams to be doing, but then again they are the intruders, not us.

There is a way we can legally jam them now. Most of us think that the frequencies occupied by the broadcast stations are useless and avoid them. But these frequencies can be used for local QSOs. Providing the signal strength of the station you are talking to is high enough, you can just turn down the RF gain on your receiver until the broadcaster disappears. Of course to do this you must be zero beat with the intruder to eliminate the heterodyne from the carrier. This sounds like just the thing for those of you who want to talk to locals, but for some reason or another don't want to get 2m FM equipment.

The jamming effect of this is quite good. Although the useful communication range is small, the jamming carries much further. Additionally, if you are zero beat with the intruder, the SWLs listening on AM receivers will here you either over or behind the broadcast station. (That is, he'll be able to hear what you are saying, since the intruder provides the carrier.) There is also an element of privacy to the QSO, if you don't like people breaking in. Obviously, if only locals can hear you, you get no out-of-town breakers. Try it, I think you will be

pleasantly surprised. I got a letter from one ham who says he's been doing this for more than 20 years.

In the last column I described what *you* could do about intruders. Now I'll tell you what *we* are doing.

I've contacted as many SWL clubs that I could find addresses for, asking them to print the Intruder list in their magazines, and to print a little piece describing what intruders are and which frequencies are illegal, etc. This should help a lot since the SWLs are whom these broadcasts are intended for. If *they* start complaining to the intruders, the intruders will have to move.

From the letters I have received most hams are misinformed about intruders, and SWLs are even more misinformed (If they know they exist.). I'm also trying to get the various DX programs put on by broadcasters to do a piece on intruders (Count the BBC out on this one. . .).

All reports received will also be forwarded to the ARRL and the FCC. When a number of reports have been received on one station, the station itself will be contacted. (For what good that will do.) However, it is important that the individual amateurs also contact the broadcast station. Ten letters from individual hams are better than one from us.

What else can we do? If you have any ideas, let me know. So far, jamming and getting to the SWLs seems to be the best bet. How about an ad in the World Radio TV Handbook? Most SWLs get this publication. I can imagine the impact it would have right next to Radio Moscow's ad. Let's play on *their* terms.

I need more reports from the West Coast. The intruder situation is quite different from there, due to the propagation. I also need reports from people who can understand the Spanish language broadcasts. Most of these are directed to South America, and are also illegal. If you need report forms, drop me a postcard. They should also be available from 73 "sales representatives" and swap and shops and hamfests. I prefer reports on the forms, since that way I can be sure of getting all of the information I need.

If you would like to receive the intruder list when updated (about 2 months before publication) just ask for it. If you write a letter and want the list, please ask for it or I won't send it. This is to make sure that the people I am sending it to are really interested.

Does anyone have information on good direction finding antennas? How about maps and overlays for plotting coordinates? These could be used in conjunction with the net to pinpoint unidentified intruders.

Let me know if you want information on intruders to pass out at club meetings (especially SWL clubs). I have a sheet describing where to find intruders, etc., for this purpose. If you do, be sure to pass out plenty of reporting forms also.

There seems to be a number of intruder watchs in various countries, but apparently unconnected. I hope to get information flowing between them to try to develop an international intruder plan.

The BBC transmission "to Australia" has now shown up on 3952. If you look at schedules of other European broadcasters in the same time slot, you'll find they are using *much* higher frequencies. This is simply not possible at this time of the day. Also, there seems to be a number of broadcasters which operate on the edge of exclusive amateur bands. (Such as Trans World Radio on 7100 and Voice of America on 21450.) These transmissions are just as illegal as *the* others. You know what happens if *you* operate on exactly 21450!

WB8DBN

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

50 MHz BAND

Virg WAØYNK says the band was open for two solid hours Christmas Day from Maine to Missouri but only Paul K1TOL, was around to work it from the Eastern end. January 1, the band was open for 4½ hours in this area. The initial two hours was exclusively to the Virginia area with stations worked in Norfolk, Colonial Heights and Chesapeake. Thereafter the cloud slowly drifted allowing contacts to 1, 2, and 3 land with *numerous* stations active. Started hearing 3's working 6's, then 8's, then 9's. Finally opened to 6 land from this area around 2230Z.

January 2, the band opened around 1845Z to Long Island in the North and the Florida Gulf Coast in the South. By the time it closed at 0300Z I had 22 states in the log including Oregon, Montana and Utah.

In general December was a bummer, the first week of January fair, thereafter nil. Contest weekend was a bust for Es although scatter and groundwave were good.

Steve WBØGAR, writes from Ottawa, Kansas to tell us he is on with a Clegg Venus and both a 5-element beam and a Ringo on SSB. Steve also runs a Regency HR-6 on 6m FM with phased 3-element beams at 30'. He says he doesn't find activity enough and inquires about 6m nets in his area. Anyone with net information is invited to drop Steve a line at Box 531, Ottawa KS 66067. While you are at it drop me a line too, for a column mention.

Andy SH-W5-109, is a shortwave listener using his fathers (WB5HVE) rig to DX on 6m. Andy says he didn't hear any of the October or November openings but mentions hearing WA7FHP and a VE7 on January 6. Andy does his DXing from Mountain Home AR.

Dave KØLCB says he will be moving into a new house before long and hopes to be back on 6 in time for the June contest, but says more realistically he expects to be on for the September version. In the meantime Dave is confined to FM operation from an apartment in Independence MO.

With the coming of the New Year WWV and WWVH have changed to C.U.T., Coordinated Universal Time. What is it? Nothing different, just another terminology. You may file G.M.T. along with cycle, micromicrofarad and other terminology which has faded in the past few years.

While on the subject of time, I would like to put in a plug for the use of C.U.T./G.M.T., or whatever you prefer to call it for logging purposes. Use of standardized time makes it ever so much simpler to check your log when OSLing. Everyone in every time zone is speaking the same language. Another small and at the moment unimportant feature is the elimination of the necessity of changing your clock with the change to Daylight or Standard time.

In the January issue of 73, in the letters column there was correspondence from WA5RER requesting information as to where a Heath SB-110 could be found. As it happened I had just a day or so earlier received the latest edition of "The Yellow Sheet," known officially as the Equipment Exchange and Ham Trader. This biweekly listing of items for sale, swap or wanted to buy, is without a doubt *the* place to find a needed piece of equipment. In the issue mentioned were two SB-110s for sale and being biweekly both were fresh, not lost in 2 or 3 months of magazine publication and distribution. Available on a trial basis of 5 issues for $1, the normal price is $4 for a 24 issue yearly subscription. The address is "The Ham Trader," Sycamore IL 60178. or see *Very INTERESTING* in Caveat Emptor.

WAØABI

AMSAT NEWS

Mike Frye WB8LBP
640 Dauville Dr.
Dayton OH 45429

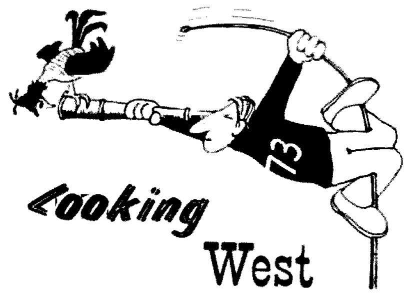
AMSAT

As of this writing all systems are progressing rapidly on A-O-B construction. The unit is undergoing preflight tests and all functions are being checked out. As far as a launch date please listen to the AMSAT nets, especially the one on Mondays at 8:00 EDT on 3855 kHz.

There have been a number of visual observations of OSCAR 6. Although the satellite is less than a yard wide it is still possible to see it at certain times as it reflects the sun. Anyone wishing information on how to optically track OSCAR 6 and other satellites may contact: Norton Goodwin, Director, ZIPSAT Information Services, 824 Connecticut Avenue N.W., Washington, D.C. 20006.

Orbital Information

Orbit	Date (Mar)	Time (GMT)	Longitude of Eq. Crossing °W.
6278	1	0045.5	59.1
6291	2	0140.4	72.8
6303	3	0040.3	57.8
6316	4	-135.3	71.5
6328	5	0035.2	56.5
6341	6	0130.1	70.3
6353	7	0030.1	55.2
6366	8	0125.0	69.0
6378	9	0024.9	54.0
6391	10	0119.9	67.7
6403	11	0019.8	52.7
6416	12	0114.7	66.4
6428	13	0014.7	51.4
6441	14	0109.6	65.1
6453	15	0009.5	50.1
6466	16	0104.4	63.8
6478	17	0004.4	48.8
6491	18	0059.3	62.6
6504	19	0154.2	76.3
6516	20	0054.2	61.3
6529	21	0149.1	75.0
6541	22	0049.0	60.0
6554	23	0144.0	73.7
6566	24	0043.9	58.7
6579	25	0138.8	72.4
6591	26	0038.8	57.4
6604	27	0133.7	71.2
6616	28	0033.6	56.1
6629	29	0128.6	69.9
6641	30	0028.5	54.9
6654	31	0123.4	68.6



Looking West

Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA 91402

LOOKING WEST

It's New Years Day, 1974. It's noon and the multitude of local repeaters are starting to come to life. VHF FM, Los Angeles style is beginning a New Year, one that we hope will bring to our hobby the change we have been hoping for since Docket 18803 was enacted. To accomplish that end many of us have contributed to a fund that will enable Marty Barrack WB6MFA, to attend the FCC hearings on January 14. Marty is an agent of the U.S. Customs Service. Hamwise he edits the monthly P.A.R.C. Bulletin.

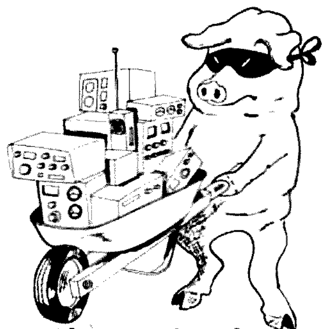
Drive in, tune-up, tune-in and drive out! That was the theme of the December 9, "Tune-Up Party" sponsored by the Pallisades Amateur Radio Club of Culver City. Some of the most advanced spectrum analysis equipment was available to do the job, so it was easy to see what each transmitter was putting out and where. Just about every rig available to the ham on 2m FM was represented at the "Tune-Up Party," and the findings will be sent to the respective manufacturers for their evaluation.

No amateur wants his rig to interfere with his fellow amateur's or any other service. Tune-up parties such as this one are a means to that end. We have plans in the works for another such event, and the Mt. Wilson Repeater Association is also planning such an event. I hope that this idea catches on nationwide so that hams and those that build ham equipment will know how their equipment stacks up after over-the-air use.

If you and your rig ever make it out to Los Angeles don't be too surprised if you hear a 10-4 or a signoff with a 10-7. Your rig has not magically turned into a CB set. Many repeaters in this area use the land mobile 10-code in its original un-CB bastardized form. The hams didn't steal it from the 11m crowd. Most of the VHF FMers in this area who put up the first remotes and repeaters are in the commercial radiotelephone business and use of the 10-code system in amateur radio is a carry over from their profession. Not all repeaters here require its use, but if you do happen to here someone go 10-10, call him, he is looking for another contact.

And that concludes Looking West for this month. With any luck we will be back in 30 days to further update you on whats going on in the Sunny Southland.

WA2HVK/6



The Hamburglar
STRIKES AGAIN!

List from Past Issues: Mfr., Model, Ser. No.	Owner	Issue
AF68 No. 10888	K5LKL	1/73
PMR8 No. 10918		
M1070 pwr supply		
Trio TR2200 No. 241969	WA2ZBV	1/73
Clegg 22er No. 1900-578	W1DHP	2/73
Standard 826M, No. 112007	WA8PCG	3/73
FM27B No. 27013-1141	W2LNI	4/73
FM-144-10L No. F459	WA6WOA	4/73
NPC 107m pwr supply		
2, 5AJ-IPL Onan Gen.,		
No. 327885		
R4B No. 11578G	WA8GVK	6/73
T4XB No. 17801 G		
W4 wattmeter No. 8390		
Swan 250 No. F154806		
Swan ac pwr supply		
No. 0653556		
HR-2 No. 04-C2879	W6GSR	6/73
SB-34 No. 21 1828		
STD 826 No. 011268	WA2FSD	6/73
HT220 No. GJ7327	State Univ. of NY (Albany)	6/73
Yaesu FT-101	W4GF	7/73
No. 82G 12279/CW		
HR-2 No. 0302030		
Clegg 27B No. 72013-1068	W3BXL	7/73
STD. 826 MA No. 208078	WB2DEW	7/73
Drake ML-2 No. 10582	W3MSN	8/73
Sonar FR-2528 No. 21-4250	Doherty	12/73
STD SRC-851-SH		
No. 9725		
STD SRC-707C		
No. 2833		
TPL PA-6-IDE No. 1092		
RP MEA-22 No. 212		
Two Larsen antennas		
Swan 270 No. M-252616	W4NTB	12/73
STD SRC-146A		
No. 208070	W7DKB	12/73
Marker Luxury	W7BVP/6	2/74
No. 2296		
Regency HR-2A 2m FM	WB8NSU	3/74
No. 04-05632		
Collins Model KWM-2	W9JS	3/74
No. 13551		

SSTV SCENE

Dave Ingram K4TWJ
Rte. 11, Box 499, Eastwood Vil. 50N
Birmingham AL 35210

Independent sideband keeps growing in popularity, as evidenced by the interest and recent abundance of information on its use. (You didn't miss the fine article in 73 in November, did you?) The easiest approach to ISB is a phasing network for connecting two transceivers (one on USB running audio and one on LSB running SSTV) to a common antenna or linear, as in Fig. 1. If you have an extra sideband transceiver (like a mobile rig) or can borrow one, just rig up this network and join in on the action. Referring to Fig. 1; The

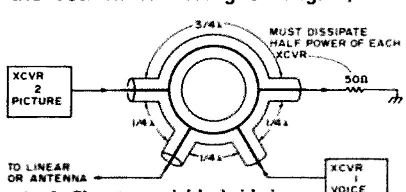


Fig. 1. Shunt coaxial hybrid ring.

$$\text{Length of } \tfrac{1}{4} \text{ wavelength cable} = \frac{492 \times \text{Velocity factor of coax}}{2 \times \text{Frequency (MC)}}$$

Example:

$$\text{Length of } \tfrac{1}{4} = \frac{492 \times .79}{2 \times (14.230)} = 13.65'$$

note: .79 is velocity factor of RG 59 foam.

$$\text{Length of 3/4 wavelength cable} = \frac{3X\ 492 \times \text{Velocity factor of coax}}{2X\ \text{Frequency (MC)}}$$

network is made up of 3¼ wavelength and 1¾ wavelength pieces of coaxial cable. Since we are dependent on frequency of operation and velocity factor of the coaxial cable, formulas for finding exact cable lengths are included. For 50 Ω terminations of this network (rigs, linear or antenna) the cable should be 72 Ω. RG59 foam works nicely. Relays are suggested to bypass the "rat race" on receive but are not absolutely necessary. Our special thanks go to Dr. Don Miller W9NTP, for the information on this "shunt coaxial hybrid ring."

A few month's back I had some information in this column on the weather satellites that were transmitting faxsimile pictures, and the interest was tremendous. I know you will be glad to hear that there are a couple of articles on this coming soon in 73. Recapping briefly, the satellites mentioned transmit on 136 MHz, thus a modified "scanner," 2m rig, etc., could be used for reception. After acquiring a nice, full quieting signal, the next step is a "readout" unit for picture reception. There are basically two methods of accomplishing this. Fig. 2A and 2B, demonstrate these.

In Fig. 2A, the audio output of the receiver is fed to the "converter," which in turn drives a faxsimile unit. (Types range from elaborate commercial to inexpensive deskfax units.) This is probably the less expensive method of receiving pictures on a long term basis.

The system in Fig. 2B, reminds one of the old 'scope adapter approach to SSTV. Indeed, it is very similar since it provides horizontal and vertical

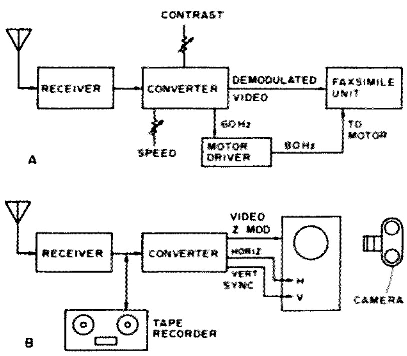


Fig. 2A and B. Reception setup for copy of APT Satellites.

deflection, plus crt video modulation to an oscilloscope. Since a picture readout is very long (approximately 3 minutes) a photograph is taken of each frame, or picture, and when developed this yields high quality faxsimile pictures. Although this method is slightly more time consuming and expensive (due to film cost) the results are much better. A tape recorder may be used with either system for taping transmissions during satellite passes, then processing the pictures later when solid copy frames are definite. Specific details on the satellites as to frequencies, locations, and times of transmissions, etc., were given in the October 1973 SSTV Scene column. Incidentally, the ATS-1 and ATS-3 satellites mentioned in that issue are 22,300 miles high, not 4,000 miles as stated.

An interesting device has been developed by MS laboratoris of Box 28425, Dallas TX 75228, for compressing and expanding audio bandwidth in an effort to more efficiently use spectrum space and improve signal to noise ratios. The unit shows possibilites for Slow Scan TV, so this month we have a brief description.

Basically, this unit uses hetrodying and balanced mixed principles to compress audio in the 300 to 2400 Hz range to (for example) 300 to 1000 Hz. In doing this we could put SSTV and audio on the same sideband, as shown in Fig. 3. Notice the arrangement of Fig. 3, it would be compatible with present SSTV standards.

Leo Cavanaugh K1GRT, carried this a little further and came up with the idea shown in Fig. 4. Sharp filters would naturally be required, however, the end results could show *some* advantages over the ISB method.

Another possibility with the frequency compression and expansion units might be to use higher scan rates

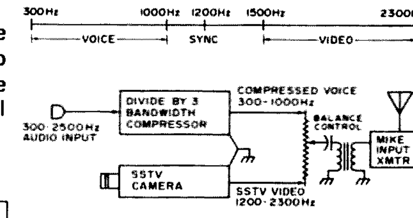


Fig. 3. Spectrum analysis of a sideband.

and 2-second frames, compressing and transmitting this information, then expanding it after reception. Theoretically this would yield high resolution 480 line type pictures. Frequency compression would be necessary because, applying the Channon Theory, bandwidth increases as scanning frequencies (and definition) increase. I should point out the previously described method has not

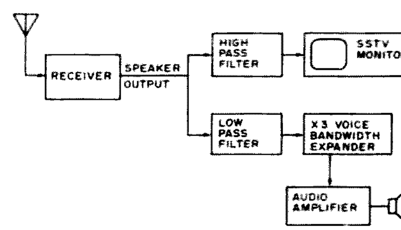


Fig. 4. Voice and video on one sideband.

been proven in actual practice, so its validity may be questionable. This is because SSTV is basically a time sample format, and decreasing its bandwidth could mean less "samples," which would result in less definition. Further experimentation and advancements in the previously mentioned ideas could prove quite fruitful to the SSTV future.

Ralph Taggart WB8DQT, reports quite a few of his SSTV monitor boards have now been sent out, so we should be hearing from some of the fellows using this fine unit in the near future. (The monitor article appeared in August 1973, 73 Magazine, page 45.) I understand commercial SSTV gear sales are also up, which indicates Slow Scan is definitely gaining in popularity.

This month's column marks my 24th straight here in 73 Magazine. Two years ago I started sharing my enthusiasm with you, and I sincerely trust the items presented here have been of particular interest to you. I would be quite interested in hearing your comments and suggestions, to assure a continuing informative column. There is a special feeling that

Continued on page 12

comes with seeing your own words in print, (especially in such an outstanding field as SSTV, like the majority of my articles have been) and I would like to encourage more of you to write up those favorite circuits, ideas or "pet projects" and submit them as articles (And hope they're accepted!). It's a great way to expand your enjoyment of an already fascinating field. . .why not give it a try.

K4TWJ

SSTV PROGRAM CONTEST WINNER

Thomas Bradley K4GXO

The poor mailman had to do double duty during the last few days of 1973 as entries in the Slow Scan Program Contest arrived to beat the December 31st deadline. Sack after sack of them arrived, making the contest judging into a major event.

The winning entry, by Thomas Bradley K4GXO, was "Ham to the End." It pictured an amateur driving along and seeing a chap with a sign warning that the world was going to end tomorrow. Our hero, who has worked all zones but one, thinks for a moment, then races home and sits down at the rig and calls CQ zone 18, obviously intending to continue at this until either the contact is made or the world ends.

Tom is the winner of the first prize in this contest, a Robot fast scan unit — something every slow scanner needs. It was most kind of Robot to offer this fantastic prize for the contest. One of the benefits of a contest like this, where nothing is sent over the air, is that it is possible to offer prizes such as this fast scan unit. The FCC rules have been interpreted by the Commission as prohibiting any prizes with actual value for on the air contests— something to do with the "without remuneration" part of the rules.

The second prize in the contest was won by Connie Owens WA1NXR, of Eliot, Maine. This was a very smoothly produced program about the New England winter — beautifully done. Connie is the winner of a Linear Systems camera lens, an F 1.9 25mm job which is ideal for slow scan. This lens will focus down to about 19". Many applications of slow scan call for getting down close, and this lens will do it. One excellent use is for working with a 35mm projector and a small screen.

Probably the best of the many runner's up was a humerous program by K8BTU which featured several cartoon characters.

Many of the better entries leaned heavily on humor, subtle and unsubtle. One, entitled "Love Story," had a couple shown running toward each other — only to pass at the last moment as the ham went on to operate his rig.

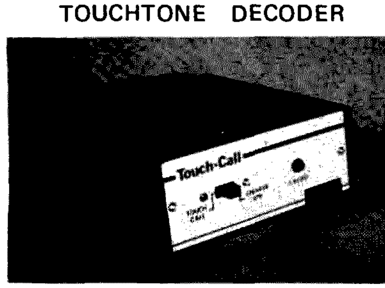
Thanks are due to all of the slow scanners who participated in the contest. Hopefully some of the ideas generated for the contest will perk through and result in an improvement of the general run of programs being sent over the air.

It might be well to have two types of programs available, one for poor conditions and the other for closed circuit copy. There is no point in repeating frames when you know that every one will get through. In general you know how well you are doing before you get into much of a slow scan exchange. Conversely you want to keep it simple when conditions are rough — your call, name, location, all sent several times — probably white on black.

A cassette of the winning entries in the Slow Scan Contest plus 10 of the best runner up entries (totalling 12 shows) is available from 73 for $4.00.

NEW PRODUCTS

TOUCHTONE DECODER



Cepco has come out with a simple decoder that should find many applications. Individual operators will be able to use it as an autocall device to turn on their speaker when the proper three or four tones are received. Repeater groups can use it to decode access tones to permit phone patches or other operations of the repeater.

Autocall, if it becomes popular, could lend a whole new dimension to amateur radio. How many times have you missed talking to someone because you weren't monitoring? How many times have you had a sked and remembered it a half hour late? How many times have you tried to get someone via a repeater and missed them. They were probably just wasting their time watching television or reading, and an autocall unit would have made all the difference.

The Cepco unit is about as simple to use as can be. You feed in audio from the receiver and 12V dc. Out comes audio for the speaker or a repeater. A switch on the front bypasses the decoder when you want to check the receiver or use it normally. There is a light on the front to tell you if you were called while you were not there to hear the call. Obviously, with a simple tape recorder you could arrange it so messages could be waiting for you. Charlie could give you the beep-beep-beep and leave word that he'll be looking for you at 9 PM.

The Cepco can be set up with any set of three or four tones, which must be received in the right sequence. It is virtually foolproof, which is important for an autocall unit.

For more information write to Cepco, Box 189, Duncanville TX 75116.

NEW RACK MOUNT DISTRIBUTION AMPLIFIERS

Ramko Research of Sacramento CA has introduced a new line of rack mounted audio distribution amplifiers with up to 32 completely isolated balanced outputs. These low cost units feature individual output amps for maximum isolation.

This Ramko series includes five models. The DA-6R features six balanced 600 ohm outputs with level control pilot light, ON/OFF switch and fusing and audio input/ouput barrier strips on the rear. The DA-6BR has in addition six individual front panel level controls. The DA-6RS

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you are interested, send *73* your name, address and phone number. Don't be bashful — remember, it's always easier when you have someone to give you that added bit of confidence.

73 would appreciate amateurs and clubs looking this list over and helping whoever they can. Do you remember when you needed help?

R. Gary Hendra WN6SUW/6
Stern 217 Twain
Stanford CA 94305
(Would like help with General license.)

Mike Moy
4925 Brookside Road
Menton OH 44060
216-257-7565

offers 6 stereo pairs or 12 mono out with 2 inputs. The DA-16BR and DA32BR provide 16 and 32 completely isolated balanced outputs with metering, switchable to monitor outputs, balanced bridging/matching inputs for each group of 8 outputs, and individual level controls with headphone monitor jack.

For more information contact: Ramko Research, 3516-B La Grande Blvd., Sacramento CA 95860. Tel. Number: 916-392-2100.

MCM14537, 256-BIT RAM MAKES DEBUT

Motorola Semiconductor Products Division has announced the addition of a 256-bit static random access memory device to the proprietary series of the McMOS product line. Applications for the new device include portable instrumentation, industrial control systems, and other areas which require medium speed at micropower operation with exceptional noise immunity such as scratch pad and buffer functions. Four of these devices may be used to build a 1024-bit RAM without additional address decoding provisions. An output decoding latch elimiates the need for a storage buffer function; the wired-OR output capability provides three-state operation for memory expansion.

Two device versions are available in accord with system temperature requirements? The AL suffix denotes the full military temperature version and the CL suffix denotes the standard commercial version. Both are available in the type 690 ceramic DIP configuration. For more information contact: Technical Information Center, Motorola Semiconductor Products, Inc., Box 20924, Phoenix AR 85036.

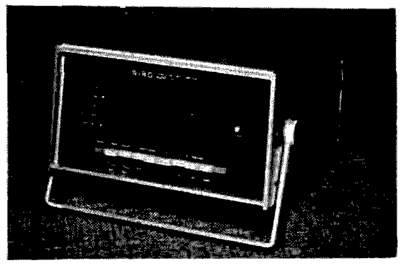
CLAMP METER FOR VOLTS/AMPS/RESISTANCE

Panasonic has introduced a clamp meter that measures volts, amps and resistance. To measure current simply clamp the meter around one conductor and read the current on the graduated scale. Current ranges to 1200A, voltage ranges to 600V and resistance measurements to 5000Ω are standard.

Although the clamp meter is small in size and light in weight, it is very easy to read due to the slope design of the meter scale. The meter also comes equipped with lead wires for voltage measurements, a special adaptor for resistance measurement, and a deluxe carrying case. Two models are available, the model 300/600 measures wire sizes to 1.02 dia. and the model 1200 measures wire sizes to 1.889 dia.

Price and delivery are available from: Panasonic Industrial Division, 200 Park Avenue, New York, New York 10017.

DIGITAL RF WATTMETER



The model 4371 THRULINE Directional High-Power Wattmeter is the first digital insertion instrument for measuring forw..rd or reflected CW power in coaxial transmission lines. It accurately measures power flow under any load condition from 25 to 520 MHz and from 1-1000 watts in six ranges. Model 4371 is also the first High-Power Directional Wattmeter which the user can calibrate in the field to known RF power standards, eliminating weeks of transit for periodic certifications.

This Wattmeter measures CW, AM, FM and SSB signals. Its digital readout makes it ideal for production testing and continuous service applications since the information is displayed with the decimal point in place. No Plug-in Elements are needed since all variable measurement parameters – frequency range, forward/reflected power and full scale values – are pushbutton selectable right on the front panel. The readout unit and the line-section may be separated by as much as 5 feet for operation convenience.

For more information contact: Bird Electronic Corporation, 30303 Aurora Road, Cleveland (Solon) OH 44139.

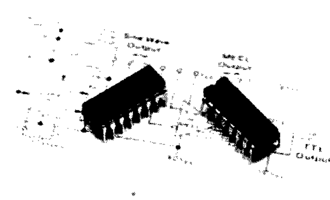
LINEAR IC DATA BOOK

Motorola's 3rd Edition of the Linear Integrated Circuits Data Book is just off the press and has been expanded to over 800-pages, 100-pages more than the previous edition.

In addition to device listings and data sheets, an interchangeability guide and listing of available Application Notes is included. Package outlines, pinouts and numerous schematics are abundantly provided. At $3 per single copy it is a bargain buy for the solid state bookshelf.

The Linear Integrated Circuits Data Book may be ordered from Motorola Semiconductor Products, Inc., P.O. Box 20924, Phoenix AR 85306, or from your Motorola Franchised Distributor.

LOW–COST CRYSTAL OSCILLATOR



Ideal for reference oscillator and clock applications, the new crystal oscillator features a choice of complementary sine wave, single-ended MTTL, and complementary MECL outputs from a single IC chip. Designated the MC12060/12560 for operation from 100 kHz to 2.0 MHz, and the MC12061/12561 for the 2.0 to 20.0 MHz range, these devices operate with a fundamental series mode crystal. Stability is excellent, averaging -0.08 parts per million/degree centigrade (ppm/°C) for the MC12060/12560 -0.16 ppm/°C for the MC12061/12561 devices. The wide range of output combined with the high-stability make these new circuits ideal for many phase-locked loop applications.

The medium-scale integrated circuit consists of a voltage regulator, an oscillator, an amplifier/automatic gain control, a sine to MECL translator, and a MECL to TTL translator. The only external components required to produce a highly stable oscillator are the crystal and two bypass capacitors, plus usual power supplies. Operation is from a single power-supply. Sine wave output voltages range from 800 millivolt peak-to-peak (no load) to 500 mV p-p at full load.

Currently available in a 16-pin, dual-in-line ceramic package the 12060L/12061L and specified over the 0 to 70°C temperature range and are priced at $4.35 each in 100 to 999 quantities. The MC12060/12560 operate from 100 kHz to 2.0 MHz and the MC12061/12561 cover the 2.0 to 20.0 MHz range. The full military temperature operation (-55° to +125°C) is specified for the MC12560/12561 devices and will be available soon.

For more information please contact the *Technical Information Center, Motorola Inc., Semiconductor Products Division, P.O. Box 20924, Phoenix, Arizona 85036.*

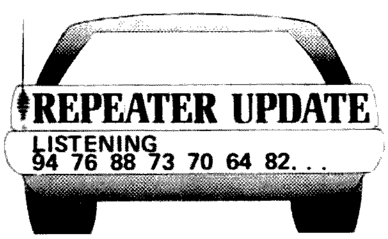
73 REPEATER ATLAS REGISTRATION

REPEATER CALL (WR only)	FORMER CALL	LOCATION (City)	STATE

INPUTS	OUTPUTS	TT Wh TB PL	FM AM RTTY	AUTO PATCH	ERP	
		Hz				USEFUL RANGE (RADIUS)
		Hz				
		Hz				EQUIPMENT
		Hz				☐ SPLIT SITE
		Hz				ANTENNAS & HEIGHT ☐ DIPLEXER

REPEATER GROUP/SPONSOR	TRUSTEE	ID—TYPE OR MFR.

☐ I certify that I have received no outside assistance while completing this form.		
DATE	SOURCE (NAME/CALL)	SPECIAL OR EMERGENCY FUNCTIONS



AL	WR4ADJ	Florence		146.01-146.61
	(former call: W4JNB)			
CA	W6NRY	Johnstone Peak		146.22-146.82
	(former call: W6FND)			
CA	WA6ALV	San Bernadino		146.25-146.85
				223.26-224.88
CA	WR6ABJ			
AL	WR4ADJ	Florence		146.01-146.61
CA	W6NRY			
AL	WR4ADJ	Florence		146.01-148.61
	(former call: W4JNB)			
CA	W6NRY	Johnstone Peak		146.22-146.82
	(former call: W6FND)			
CA	WA6ALV	San Bernadino		146.25-146.85
				223.26-224.86
CA	WR6A6F	Mt. Wilson		147.435-146.40
	(former call: WA6TDD)			
CA	WR6ABJ	L. A.		146.07-146.67
				223.26-224.86
CA	WR6ADH	Monterey Park	T1.8	147.87-147.27
	(former call: K6SIR)			
CT	WR1ABR	Stamford		146.055-146.655
FL	WR4AER	Orlando		147.12-147.72
				444.5-449.5
GA	WR4ADH	Rome	W2.1	146.34-146.94
	(former call: W4VD)			
IA	WR∅ACU	Iowa City		146.28-146.88
IL	WR9ABY	Chicago		148.16-146.76
				443.75-448.75
	(former call: WA9DRC)			
IN	WR9ALI	Anderson		146.22-146.82
				146.34-146.76
	(former call: WA9WVC)			
MI	K8WNJ	Muskegon	T2.25	146.22-146.82
MI	WA8PUD	Grand Rapids	T2.4	146.34-146.94
MI	WB8HEE	Whitmore Lake		146.13-146.73
MI	WR8AAA	Milford		146.19-146.79
MI	WR8ABI	Kalamazoo		146.19-146.79
	(former call: K8TIW)			
MI	WR8ABZ	Jackson		146.28-146.88
	(former call: WB8CSQ)			
MI	WR8ACF	Detroit	PL	146.04-146.64
	(former call: K8VLN)			
MO	WR∅ACT	Independence		147.69-147.09
MS	WR5ACC	Jackson		146.16-146.76
MS	WR5ABT	Jackson		146.28-146.88
NB	WR8ABA	Bellevue		146.04-147.30
NJ	WR2ACQ	Northfield		146.16-146.76
	(former call: K2CIR)			
NY	W2CXM	Ithaca		DELETE
NY	WR2ADA	Utica		146.16-146.76
NY	WR2ABD	Tompkins County		146.37-146.97
NY	WR2ABK	Staten Island		CLOSED
NY	WR2ACV	Brooklyn		147.43-146.43
	(former call: WA2ZWP)			
OH	W8WTB	Columbus		146.16-146.76
OH	WR8ABC	Cleveland		146.28.146.88
	(former call: WB8CQR)			
RI	WR1ACE	Lincoln		146.16-146.76
	(former call: WA1OZF)			
RI	WR1ACG	Johnston		222.38-223.96
SD	WRBACK	Sioux Falls		146.16-146.76
TN	WR4ADD	Kingsport		146.16-146.76
TX	WR5ABA	Dallas		146.01-146.61
WA	WR7ACJ	Seattle		146.37-146.97
WV	WR8ACJ	Parkersburg		146.37-146.97
	(former call: WB8CRD)			
Foreign				
Canada				
	VE3TIS	Timmins		146.34-146.94
England				
	GB3BC	Pontypool		145.15-145.75

TOUCHTONE FOLLIES

GOOD NIGHT, LADIES

9 7 4 4
Good night, lad-ies,
9 7 2 2
Good night, lad-ies,
9 7 0 0
Good night, lad-ies,
9 6 6 5 5 4
It's time to leave you now.
6 5 4 2 3 3 6
Merr-il-ly we roll a-long,
5 5 8 3 3 6
Roll a-long, roll a-long,
6 5 4 2 3 3 6
Merr-il-ly we roll a-long,
6 5 5 3 2 1
From sea to shi-ning sea

THE OLD GREY MARE

4 4 4 4
The old gray mare
8 6 6 8 6 8 4
She ain't what she used to be
8 8 4 8 8 4
Ain't what she used to be
6 6 8 6 8 4
Ain't what she used to be
4 4 4 4
The old gray mare
8 6 6 8 6 8 4
She ain't what she used to be
8 8 8 6 8 4
Ma-ny long years a-go

DX FOOTNOTES

By: Gus M. Browning, W4BPD
Drawer "DX"
Cordova, SC 29039

Two days after I had written about SY5MA being active and handing out Mount Athos contacts I find that he had to all of a sudden "flee" the country (he was actually living in Greece, near the Mount Athos border). It was really a shame too, because he was just about to get rolling over there and I am sure that if things had not went wrong he would have had Mount Athos off the "rare country" list in a short order. He is now in Penna. and I guess about to again become active chasing his first love, DX.

I keep hearing that the sunspots is just about at their minimum, and a few even say it has passed and then a couple of the "experts" say it will be late this fall or coming winter before the minimum is reached. As for me, about all I can say is that there certainly is a lot of good DX being worked, regardless of the sun and its spots. If it gets any better when the spots get more numerous you will have rare DX QRMing rare DX ! It will be nice, though to have good 10 meter conditions and all nite 15 meter openings (and 20 too at times-, especially those winter nites). During this coming, up-hill climb of the sun-spots I have high hopes of being in a rare one or two myself, the old DX spirit is still "in there", it has not been asleep, just resting up" a bit !

With the energy shortage I would think that there would be a lot more fellows in there chasing the DX than usual, because if they can't be in the car running all over, then they will be at home and chasing DX is certainly better than "twiddling their thumbs". As for myself I have been having some great fun building up a bunch of solid state "gadgets". So far have built up a very FB, solid 100 kc xtal osc, xtal in an oven and have been zero beat with WWV now for well over a month. Wont mention other items built right now, but I am learning a lot about those little solid state "things", because you can be sure they are here to "stay", and those hot tubes are on their way out ! !

I have been talking with a number of DX'ers who have found a new interest in DXing via "Amstat". A few have worked as many as 43 different countries and they all say it is just a matter of time before someone makes WTW-100 or DXCC via the satellite. Some fellows are using only about 5 watts to a fairly simple antenna. He was telling me that the antenna he used consists of only about 8 yagi elements all on the same boom. It seems as if most of the fellows are using cw at the time this is being written. The nice part about this way to work DX is those sun-spots don't bother yOu because most of your contacts are the "line-of-sight" way. If any of you are tired of DXing the old way, I strongly suggest that you try working DX via Amstat ! Sounds very interesting to me, especially now with the sun-spots so low - try it ! A number have already made WAS. The first two I know of are W3TMZ and W6EJJ (2 old time DXers from the other bands) and VE2BYG was getting very close to his WAS.

Still plenty of new ones for the prefix chasers, seems as if they will never run out of new prefixes. Every little event seems to bring forth a few new prefixes. If any of you would like to try out a new prefix you might think of operating at your county fair, your city anniversary, state anniversary or maybe a Boy or Girl Scout Jamboree. I am sure you could come up with some good reason for FCC to issue you a "Temporary Prefix" to celebrate the occasion.

Still no sign of operation from such rare ones as, Iraq, Burma, South Yemen (ex-Aden-VS9-land), China, Tibet, Royal Knights of Malta (in Rome, Italy !), Zanzibar proper, and a few more that don't come to mind at the moment. Or maybe with the new China friendship things might be worked out with both China and Albania whereby an American could operate from both of these spots. I would think the approach would have to be worked out from a "high level". Maybe Wayne Green could do like he did with the King of Jordan.

I would like to hear from as many readers of this column as possible with suggestions as to what they would like to see more of and also "less of". I am sure that many of you have some FB suggestions and some have a few personal "gripes", well here is your chance to be "heard" ! I can give you QSL info until it runs out of your ears, or I could fill the entire page with pictures, if that's what you want. Up to now I have been trying to very broadly cover anything that has a DX slant so as to have a little of everything. So how about this fellows ? My full address is at the top of each article, every month.

A FEW BITS OF QSL INFO:

VE3AII/SU - Alan Leith, 200 Willett St
Apt. 525, Halifax,
Nova Scotia, Canada

DX (the prefix DX) was used by stns. in the Phillipines during their 41st anniv. in late Nov. early Dec. of '73. Send ur cards to the appropiate DU call sign.

HH2WF via WA2JDT
3D6AZ (ex-3B8CZ) to: D. Mather,
P.O. Box 626, Manzini
Swaziland, Africa.
4W1BC via G3SUW
9U5CR-via ON5TO
W4BPD DXpeditions (all of them)
QSL via Herman, W2MZV
VU2ABO via HB9ABO
VU7GV via Sulu, I.S.P.W.
Port Blair, Andaman Is.
Via India
WB4BUQ/8R1 via WA6MWG
ZE8JN via WB4VUP
5T5LO via K4KXA with SASE pse.
9J2BL via RW65, Lusaka, Republic of
Zambia with 5 IRC's if you
want an air mail reply.
9J2PH via Bureau
HKØBKX via WA6AHF
MP4BJP via WB4WPP
5V7GE via Box 196, Atakpame
Togo, West Africa
9K2DC via Box 77, Kuwait, Persian
Gulf
TF3AW via P.O. Box 1058,
Reykjvik, Iceland
ZB2CS via W9JVF
9X5NA via W7LFA

If any of you "happen" to go to The Dayton Hamvention (in late April) be sure to take your camera and a good, fast re-cycling electronic flash. You will have plenty of "Big Shots" to photograph. Don't miss visiting the North Jersey Suite almost any night during the convention. (Oh Yes Wear your high hip boots, the stuff gets a little deep around midnight) ! The picture shown below was snapped one night in the N.J.D.X.C. Suite last year. (Tnx to WB8HAT for pix). Left to right is K4MQG, WB8HAT, K7CBZ (1S1A, XV5AC) and W1YRC. (they were probably real "happy" an hour or so later on !-hi)

Peggy and I have our hopes high to again be there this year and we will be looking out for our friends. Lets all hope those sun-spots will soon become more numerous and all the bands will began to "crawl" with rare DX again.

Got ur autotransformer ready yet ? Mine will step 90v up to 120 ! In case its ever needed - Brown-outs, maybe ! That's it for this month-73, Gus BPD

David Horton K8JNE
P.O.Box 791
Jackson MI 49204

THE SENSUOUS CAVITY

One of the greatest and most positive influences on Amateur Radio to date, as activity and commercial sales prove, is 2 meter FM. Repeaters, autopatches, and solid–state transceivers have become commonplace in today's headlines and QSO's. As the Fraternity's equipment and knowledge advances, it is also common to be affected by the problems of transmitter noise and spurious, receiver desensitization, and intermodulation interference. The purpose of this article is to discuss the causes and cures of these problems and familiarize the reader with one of the most effective and practical weapons available, the cavity. Although this discussion certainly involves repeaters, more generally it pertains to all VHF transmitting and receiving apparatus. The format is intended to be philosophical rather than mathematical.

Transmitter Spurious

Most of the output energy of a transmitter is contained within the narrow band of frequencies corresponding to the intended transmit channel. Unfortunately, some unwanted energy is also present outside of the channel as a result of sideband noise (white noise), birdies, harmonics, etc. It is the responsibility of the licensee to minimize this spurious energy to the degree that it does not interfere with other spectrum users. The typical 2 meter transmitter radiates enough noise to degrade the performance of a receiver operating several megahertz and several thousand feet away and transistor circuits usually generate more than vacuum tubes. This type of interference cannot be corrected at the receiver since the noise is coincident with the receiving frequency. It must be removed at the transmitter. Most communities have enough activity on various channels to make it imperative for stations

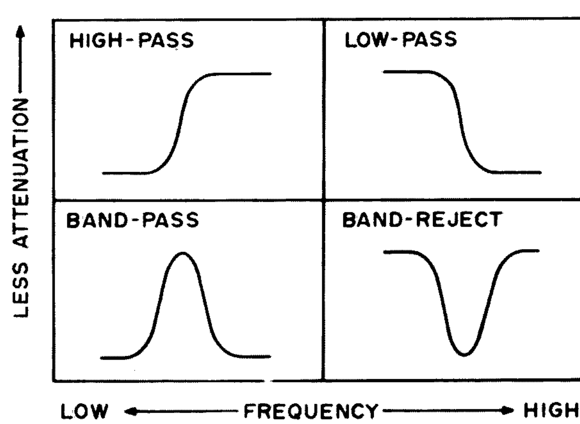


Fig. 1. Filter response curves.

with high effective radiated power to take special precautions to prevent spurious radiations.

Receiver Densense

Although transmitter sideband noise interference is sometimes included in the category of receiver desensitization, more commonly, the term desense is used to identity the situation where a strong off–channel signal overloads the receiver

front–end, changing critical voltage and current levels to the degree that receiver performance is degraded at its operating frequency. This problem can be recognized by noting that the receiver limiter current from a weak signal will drop when a strong off–channel transmitter operates. Desense must be corrected at the receiver since it is not a transmitter fault.

Intermod

Intermodulation interference is caused by two or more signals of different frequencies mixing to produce undesirable intermodulation products. Although this mixing usually occurs in the receiver front–end or transmitter final amplifier, it can actually occur in any non–linear device, such as a dirty guy–wire connection. Intermod is identifiable by noting that the interfering signal may cease in the middle of a conversation, corresponding to when one of the signal sources ceases to transmit.

Generally, receiver intermod results when several external signals eminating from transmitters possibly miles away mix within the receiver and a product falls within the receiver's passband. This type of interference is caused by a deficiency in the receiver, not the transmitter.

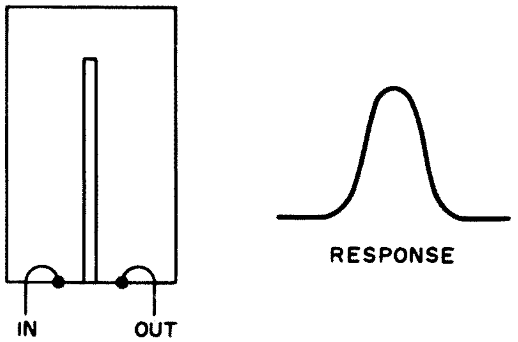


Fig. 2. Band–pass cavity.

The common cause of transmitter intermod is a surprise to most. Here again, intermodulation products are generated from the mixing of several signals. However, the mixing takes place within the final amplifier stage and involves one or more external signals that enter the transmitter thru its own antenna and then reradiated as an undesirable product. This phenomenon normally occurs only when several transmitters are operating within a few thousand feet of each other and it must be corrected at the mixing transmitter.

Filters

Since the topic of design and maintenance of transmitters and receivers is beyond the intended scope of the discussion, let us assume that the equipment is designed and maintained reasonably well and that general housekeeping has been done, such as shielding, tuning, matching, etc. This brings us to a topic of filters.

There are several electrical characteristics commonly referenced when evaluating a filter, some of which are easily understood, such as power capability and insertion loss. However, the frequency response characteristic requires careful interpertation to rate the device's performance. Generally speaking, there are four categories of response: high–pass, low–pass, band–pass, and band–reject. Refer to Fig. 1.

High–pass and low–pass filters, as their names imply, pass frequencies either above or below a cut–off frequency and attenuate all others.

Band–pass is the characteristic of passing only a band of frequencies within the spectrum and attenuating all others above and below the pass–band. Band–reject, also called notch or stop–band, is the passing of all frequencies except a band of attenuated frequencies.

At VHF, the passive L/C circuit is the most common and practical filter. It can materialize in a variety of forms, ranging from the low Q coil and capacitor tuned circuit (also called a helical resonator) to the high Q resonant cavity.

Cavaties

At microwave frequencies, a cavity is an empty resonant box. However, the dimensions of a resonant box for the 2 meter band wouldn't fit thru the average doorway, so the resultant compromise is a 1/4 wavelength resonator enclosed within a conductive housing. This device, still called a cavity filter, exhibits a Q much greater than the ordianry helical resonator and operates in either the band–pass or band–reject (notch) mode. Refer to Figs. 2, 3, 4, and 5 for

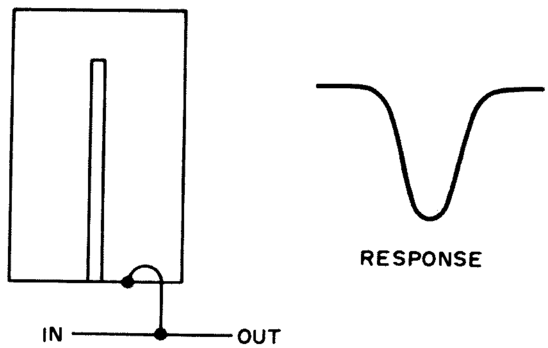


Fig. 3. Parallel connected band–reject cavity.

configuration and response illustrations.

Cavities are used for eliminating noise, spurious and intermod from transmitter emissions and for imporving receiver front end selectivity to eliminate receiver intermod and desense. Performance can generally be improved by cascading cavities.

The band–pass cavity has the advantage of attenuating all frequencies outside the pass–band rather than just attenuating a limited band of frequencies as with the

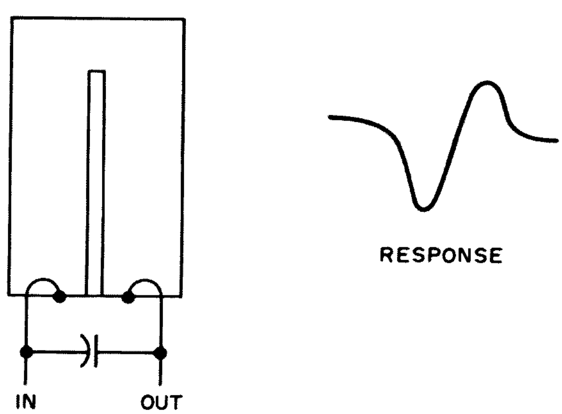


Fig. 4. Series connected band–reject cavity with capacitive reactance anti–resonant node.

band–reject cavity. However, the band–reject cavity is preferred where the frequency to be rejected is quite close to the frequency that must pass, for example 200 kHz to 1 MHz. The average band–pass cavity becomes inefficient when the separation between pass and reject frequencies is less than 2 MHz but it does outperform the band–reject cavity for wide separations.

Low impedance interfacing to the cavity is accomplished with coupling loops. The amount of coupling greatly affects the delicate balance between insertion loss and selectivity. Minimizing coupling enhances the Q.

A major problem with home–brew cavities is temperature stability. A high performance cavity can shift dozens of kHz for only a few thousandths of an inch change in the dimensions of the center resonator. One technique to improve stability is to use special metals with zero or complementing expansion coefficients. Commercial cavities are available within a price range of $25 to $350.

Duplexers

The duplexer is a device that connects a transmitter and receiver to the same antenna and allows concurrent operation. Although a "T" connector may fit this definition, the radio–man expects to see a passive network of from 2 to 6 cavities inter–connected in either a band–pass or band–reject configuration that provides 50 to 100 dB of isolation between transmitter and receiver ports.

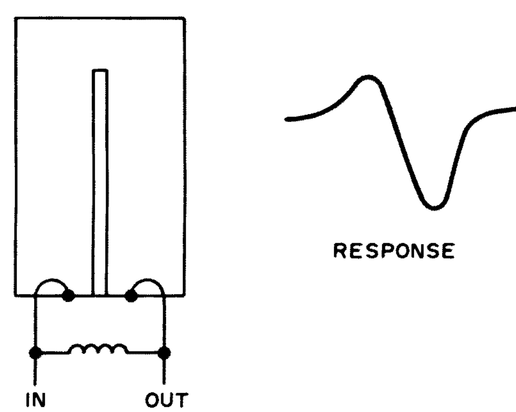


Fig. 5. Series connected band–reject cavity with inductive reactance anti–resonant node.

The band–pass duplexer is preferred for wide frequency spacings. In addition to providing the required isolation between transmitter and receiver, it also improves overall receiver front–end selectivity and attenuates all transmitter noise and spurious that occurs outside the duplexer's passband.

The band–reject duplexer is used for close frequency spacings, such as our current repeater 600 kHz standard. However, it does

not contribute much selectivity to the receiver or transmitter except at the intended notch. In other words, a band–reject duplexer is a poor choice as a solution for intermod.

Other Devices

A circulator is normally a three port device composed of ferrite material, magnets, and lengths of transmission line, that functions as a directional rf valve. Referring to Fig. 8a, rf entering port 1 comes out port 2, not port 3. Rf entering port 2 comes out port 3, not port 1, etc.

An isolator is a circulator with a dummy load connected to one port. As shown in Fig. 8b, it passes rf energy in one direction but not the reverse. Although the isolator can help correct transmitter intermod problems, it is not a preferred weapon due to its frequency and SWR sensitivity, its generation of harmonics, and a price tag of several hundred dollars.

The hybrid coupler or combiner is used the same as a TV 2–set coupler, to connect multiple transmitters or receivers to the same antenna and hence, has no value to this discussion of interference.

Repeaters

One of the basic requirements of a repeater system is to have sufficient signal isolation to prevent the transmitter from interfering with the receiver. Various techniques can be employed to provide this, including cavities, duplexers, separate antennas or separate sites for the transmitter and receiver, special shielding, etc.

Even though sufficient isolation may have been achieved to allow a repeater to repeat, a system often requires additional effort to eliminate intermod and other kinds of interference. Certainly, there is no cookbook approach to solving these problems and in reality, the solutions may be more numerous than the quantity of repeaters. Fig. 9 demonstrates cavity placement possibilities to enhance system performance.

Let's bring all this hypothetical interference into perspective by examining typical situations.

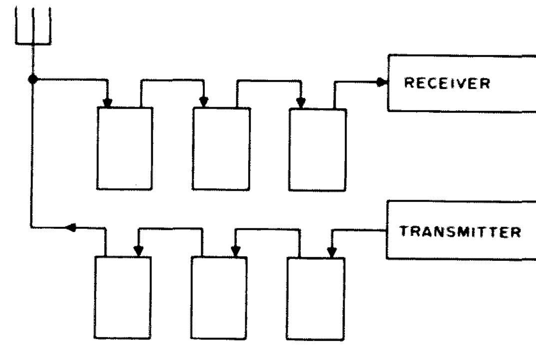


Fig. 6. Typical band–pass duplexer.

Problem: A 2 meter mobile transceiver experiences intermod from commercial two–way stations while operating in the downtown area of a city that has many high–power commercial stations. Other amateurs have the same problem using a variety of gear. However, there are some rigs that don't have the problem at all.

Solution: Many transceivers presently on the market have receiver intermod and desense problems when operated in the vicinity of transmitters who may be many MHz removed. Since some rigs don't have the problem in this example, we have enough information to conclude that the mixing is occurring in the transceiver indicating insufficient front–end selectivity for this environment. One cure is to add a band–pass filter or a wide–band band–pass cavity ahead of the receiver. Also, if a front–end transient protection diode is present, it should be placed after the tuned circuits rather than directly across the receiver antenna input.

Problem: A base station listening to weak stations on 146.52 or 146.85 or 146.94 MHz is overloaded with noise whenever a repeater, located about a half kilometer away, transmits on 146.76 MHz.

Solution: This could be caused by side-noise from the repeater transmitter or a deficiency in the base station receiver. It doesn't appear to be receiver desense but it could be poor receiver if selectivity. If any other receiver with comparable sensitivity and located as close or closer to the repeater does not experience the problem, then the fault is not due to noise from the repeater transmitter. To further diagnose the problem, a high Q band–pass cavity tuned to

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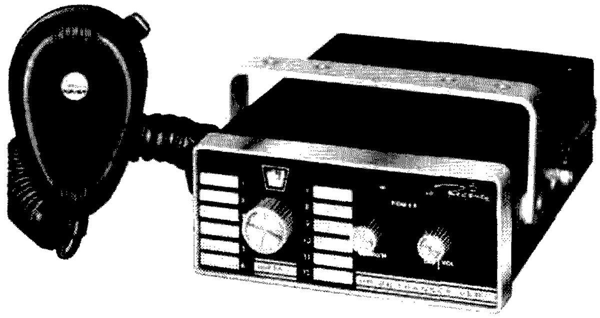

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146.52 MHz (the most distant frequency interferred with) could be inserted between the antenna and base receiver. Then, if the interference disappears on 146.52 MHz, the base receiver is at fault, not the repeater transmitter.

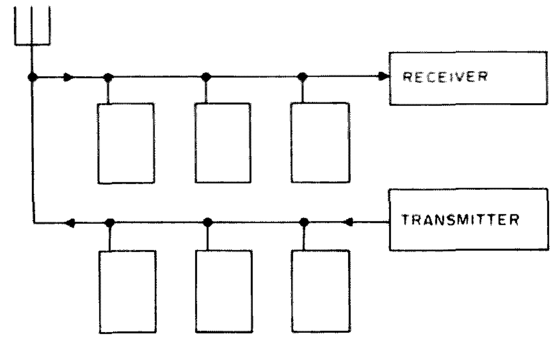


Fig. 7. Typic band-reject duplexer.

One method for attenuating transmitter side–band noise interference is to insert a band–pass cavity between the transmitter and antenna (before the duplexer, if one exists).

A band–reject cavity placed between the antenna and receiver could minimize desense and compensate for poor i–f selectivity response by notching out the repeater signal. However, a spacing of 200 kHz or more between the notch and the frequencies to be passed is required for optimum performance.

Problem: A repeater operating on 146.34 MHz input and 146.94 MHz output with separate antennas and no cavities experiences intermod that involves the 146.76 MHz output of another repeater located 1 kilometer away plus the 146.16 MHz output from a mobile station 3 kilometers away. The interference occurs only after the 34/94 repeater is keyed and then holds the repeater keyed until either of the other two signals cease.

Solution: Manipulating the numbers, we see that 146.94 plus 146.16 minus 146.76 equals 146.34 MHz. Since the three signal sources are so far apart geographically, they would be too weak to support transmitter intermod. Therefore, the fault is with the 34/94 repeater receiver. The cure is to minimize any of the three mixing signals before they enter the receiver input.

Actually, there are two problems illustrated by this example. First, the signal isolation between transmitter and receiver is inadequate as indicated from the involve-

ment of the transmitter carrier frequency. Secondly, the receiver front–end selectivity is poor as indicated by the presence of the other two weaker signals. Both deficiencies could be compensated for by installing a band–pass cavity between the receiver and its antenna. Note that this problem could have occurred with any two external signals spaced 600 kHz apart.

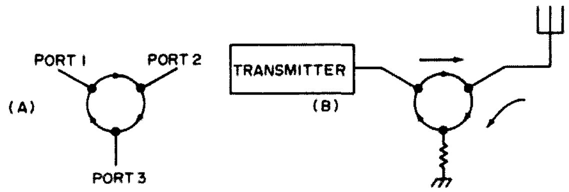


Fig. 8. (a) Circulator; (b) Isolator.

Problem: A repeater utilizing a band–reject duplexer is experiencing intermod interference that involves two or more external signals, one of which has been identified to be a commercial service transmitting 6 MHz higher and located700 meters away. The condition only occurs after the repeater is keyed and then the intermod holds the system keyed. The repeater antenna is located in close proximity to many other commercial transmitters that operate within the same band.

Solution: Not enough information has been supplied to prescribe a precise cure. We know that the repeater transmitter signal and the particular commercial signal plus one or more other external signals are involved in the mixing process butwe do not know where the mixing occurs. The problem could be in one of the nearby commercial transmitters or in the repeater transmitter or

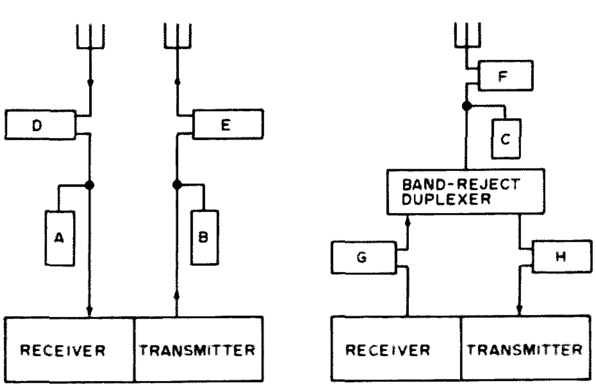


Fig. 9. Cavity placement possibilities in a repeater system. "F" is wideband.

receiver in spite of the duplexer. A diagnostic approach to identify the offending apparatus would be to install a band–reject cavity between the repeater antenna and duplexer to remove the known external signal that occurs 6 MHz higher. If the intermod still persists, then probably one of the nearby commercial transmitters or some other external mixer is at fault and will need attention. In either case, this repeater may need a band–pass cavity permanently installed between the transmitter and the duplexer to protect the other nearby stations from noise and intermod since the band–reject type of duplexer is not intended to solve these types of problems.

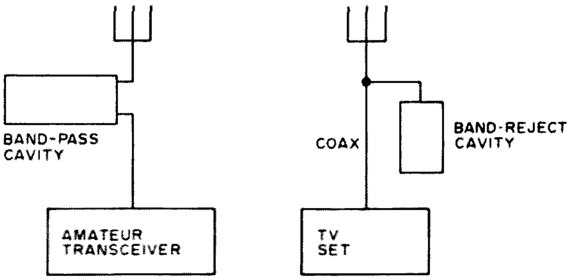


Fig. 10. Minimizing TVI.

Problem: A base station transmitter causes severe TVI. The amateur antenna is spaced only three feet from the TV antenna.

Solution: The cause is probably either transmitter spurious or too much signal for the TV system. Although your first thought might be to increase antenna separation, don't overlook the possibility of notching out the transmitter signal with a cavity in the TV transmission line. This is feasible only if the TV lead–in is coax and if there is no booster amplifier built into the TV antenna. In Fig. 10, transmitter spurious is minimized with a wide–band band–pass cavity and the transmitter signal is notched out of the TV system with a band–reject cavity.

In conclusion, let me emphasize that there is no single "best way" to cure an interference problem. A practical solution may actually be a compromise based on available resources and the depth of problem diagnosis.

. . . K8JNE

Robert D. Sexton WB6CHQ
1415 Ebener St., #6
Redwood City CA 94061

SEXTON'S LAWS

For some time now, a concerned group of scientifically oriented radio amateurs has been studying the interrelations of the amateur and his technology. In the course of this study a wealth of statistical data has been reduced to a few simple equations which – for the first time in the sixty year history of amateur radio – allow the precise calculation of the effect of his hobby on the amateur.

Heretofore such calculations would have been impossible. However, with the publication of *Parksinson's Law*[1] and the recognition thereby that mathematical analysis of man in his environment was possible, it was only a matter of time until such analysis was extended to amateur radio.

In this dissertation no attempt will be made to use these newly discovered equations, now known as *Sexton's Laws*, for design applications. Instead, the discussion shall be limited to the nature of the equations and their use for analysis. It is left to other equally inspired amateurs to develop the forms of these laws which will allow their use in design.

Background

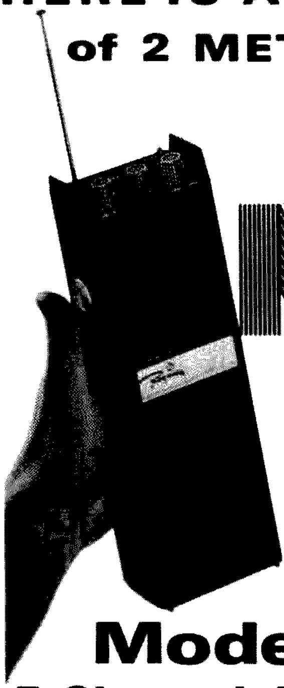
Our organization had first to determine the general nature of the ham-gear relationship. After initial debate, subcommittees were formed to study the question in depth.

At first we felt we would need to develop a mathematical model for the typical ham. This viewpoint, however, was soon dropped when we realized that we would be unable to develop a model that could encompass both SSB and CW operations. While one might think that the problem could be overcome by the use of separate models (that is, an S-parameter equivalent for the sideband ham and a T-parameter model for the CW-or telegraphy-operator) we felt it necessary to use a model that could account for the common origin of these widely different types. H-parameters were essential.

The problem of which direction our research should take was solved by the brilliant observation of one researcher. He stated that since most amateurs did not seem to be in control of their equipment normally, the obvious aspect to study would be the effect of equipment on the amateur.

This realization led to the formation of new study groups. These groups, after extensive debate (primarily on the proper semantics) determined that the three most important factors which affect the ham are the need for space, the financial involvement, and the frustration.

HERE IS A FIST FULL of 2 METER POWER



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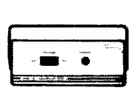
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Power Amplifier

With these factors to guide us, we were able to develop experiments and design computer aided statistical analyses of the results. We were then able to formulate the three laws of amateur radio discussed herein.

The First Law

No amateur ever has enough room and probably never will. Every ham will recognize the truth of that statement. Few, however, can accurately state how much room they need. Our research initially demonstrated that the required space is proportional to the square of the space available. The correct constant of proportionality eluded us until we realized that the required space would be determined by the activity of the amateur.

It is now possible to state that

$$S_R = KS_A^2 \qquad (1)$$

where

S_R = space required in m^3
S_A = space available in m^3
K = proportionality constant

The constant of proportionality can be calculated from

$$K = \frac{tn}{d} \qquad (2)$$

where

t = hours of operation per month
n = number of states countries worked
d = distance in miles to nearest electronic supply house

Critics of the First Law have objected that it is dimensionally inconsistent. That is, while one side of the equation must be expressed in units of volume, the other side of the equation has the apparently arbitrary units hrs-m^6/mile. Since the First Law deals, however, with the inconsistency existing between reality and the ideal in amateur radio, it follows that the First Law should be inconsistent. Furthermore, one must recall that higher mathematicians regularly deal with equations of inequality.

The constant "k" is called the *index of inconsistency*, or *Kennedy number*[2], and is explainable in that the more active the more room he needs – and the less likely he is to

find it. That it is related to his proximity to parts houses may surprise some. We believe that the explanation for this lies in the fact that such establishments are usually a stimulus to amateur activity.

The amateur who attempts the use of the First Law should be aware that the *Kennedy number* can only be determined experimentally. This will require a considerable number of actual trips to parts houses to determine the nearest one, the shortest route to it and to average out such effects as earthquakes, the thermal coefficient of expansion for asphalt, etc. Indeed, the dedicated amateur will no doubt find a multitude of reasons for exhaustive experimentation in this area.

The Second Law

Every amateur will recognize that the larger a project, the more it will cost. However, beyond the usual claims that a project will cost only a few dollars and some parts that will be found in any junkbox (that they never are is a phenomenon now under study by our group), little is understood by most amateurs about cost projection.

Two general rules were developed to explain the equation which describes amateur project cost. First, even simple projects must be as complex as possible. No amateur can tolerate equipment that he cannot monitor and adjust. This characteristic (called the "bigger-and-better" syndrome by our psychological committee) usually requires that any project have at least one meter, one pilot light, a knob and a switch. More sophisticated hams often include several "screwdriver adjustments."

The second rule is that every amateur has construction quirks, or CQs, that profoundly influence the cost of his projects. These CQs may be readily determined by inspection. They usually take the form of a predilection for printed circuits, excessive metering, or an unexplainable preference for unnecessary and expensive components. As an example, one amateur we surveyed used 1% capacitors in his power supplies.

We are now able to state that

$$\frac{C}{C_O} = p \cdot \log\left(\frac{V}{V_O}\right) \qquad (3)$$

where

C = total cost of project
C_O = cost of smallest functional unit in shack
V = total volume of project
V_O = volume of smallest functional unit
p = adjustment factor

This relationship thus requires the determination of the smallest functional unit in the amateur's station, and its cost. One obvious disadvantage of the Second Law is that the amateur must have kept accurate records of the cost of all his projects to date. This is not often the case.

The factor p is apparently dependent on the nature and number of the constructional quirks – or CQs – associated with the amateur in question. It must be determined experimentally, since the CQs have so far defied analysis on our part. It is felt that if the CQs could be expressed numerically a relationship to p would soon be determined.

While it would seem that the Second Law is impossible to apply because of the unknowns, it is useful for cost estimation. Accurate determination of the unit cost may not be possible, but if the amateur will determine the number of Unit Volumes (UV) from v/v_O, a sufficiently accurate cost estimate for most projects may be obtained (in dollars) from

$$C = 20 \log(UV) \qquad (4)$$

The Third Law

The amateur's ability to obtain results in the face of any obstacle can be expressed by his *dedication index* or *Cooper number*[3] As with the CQs, this index is not possible to calculate. To complicate matters further it is apparently a variable function of at least four (and possibly more) parameters. However, most amateurs can expect that their *Cooper number* will decrease in the course of a project. Though the rate of change is not constant, when the index reaches unity, project activity ceases. The experienced amateur can usually estimate his time of duration on a project from its complexity.

An accurate estimate of the difficulty of obtaining satisfactory results from a circuit is possible if one can determine its stability. Most amateurs presently believe that circuit

stability is deeply involved with circuit theory. Such analysis, however, only indicates that assuming *ideal* components, a circuit will or will not be stable.

It is our conclusion, however, that the only way to deal with circuits using *real* components, is through the determination of the probability of oscillation of a circuit. We found that this probability does not depend on the type of circuit, but only on the component count and component complexity. This is expressed by the Third Law as

$$P_O = 1 - \left(\frac{N_C}{N_l}\right)^2 \qquad (5)$$

where

P_O = probability of oscillation
N_C = number of components in circuit
N_l = total number of component leads

Obviously, equation 5 implies that anything with two or more leads has a better than even chance of oscillating. Theoreticians have criticised the Third Law on this point on the grounds that passive components, contrary to theory, may be able to oscillate.

One must, however, be aware that Sexton's Laws are applicable only to amateur radio. Furthermore, they were derived from statistical analysis of empirical observations and are not, therefore, based on theory. Thus, any criticism on theoretical grounds is unjustifiable.

Additionally, in the case of the Third Law, the results are an expression of probability. Anyone who has studied probability is well aware that the outcome of any event cannot be predicted from the probability of its occurence. Thus it is wrong to state that because something has a probability of ½, it must occur every other time.

Amateurs may use the Third Law to estimate the amount of time a project will require for debugging from

$$T \cong 100\, P_O T_O \qquad (6)$$

where T_O = time required to determine whether or not the project oscillated

The amateur may then compare this estimate to his estimated duration time. If experience shows that his actual debugging time greatly exceeds that predicted by the Third Law, he should not be alarmed. As every amateur knows, such projects are inherently unstable and therefore never to be entirely trusted anyway.

Conclusion

The laws of amateur radio, or Sexton's Laws, as described in this paper may be summarized thusly:

I. No amateur ever has enough space and never will.

II. The larger an amateur project, the more it will cost regardless of what it is.

III. If an amateur project works on the first try, it can't be very useful.

In application of the laws, as has been previously noted, considerable experimentation is necessary to achieve accurate results. The user should also be aware that the Heisenberg[4] principle of uncertainty is operative in all experiments dealing with these laws. This principle declares that the more closely one attempts to measure a phenomenon, the more one disturbs that phenomenon.

One might draw the conclusion that it must be impossible, under the constraint imposed by the Heisenberg principle, to obtain accurate results from Sexton's Laws. This is not so. The correct conclusion is that it is not possible to obtain accurate results from any finite set of measurements. Thus, the amateur is justified in making continual experiments.

Though controversy may arise concerning these laws, this final thought may convince even the most hardened doubter. Careful examination shows that the laws require that an amateur's station can never be complete. Is there anywhere a true amateur who can honestly say that he cannot meet that requirement?

. . .WB6CHQ

Footnotes

1. Parkinson's Law, C. Northcote Parkinson, Doubleday, New York, 1956.
2. The Kennedy Number is named for a certain amateur famed in certain circles for inconsistencies in equipment and apparent power.
3. The Cooper Number commemorates the occasion on which a dedicated amateur actually risked imprisonment for operating on 6 in a channel 2 fringe area. That this occurred in the middle of the 56 sunspot cycle should only inspire us all.
4. Physics of the Atom, M. Russell Wehr and James A. Richards, Jr., Addison-Wesley Publishing Company, Reading, Mass. 1960 p. 199.

CONSTANT CURRENT SOURCES

Larry Nickel K3VKC
216 Highmeadow Rd.
Reisterstown MD 21136

Constant current sources are developing more and more uses today. Nickel cadmium batteries are current charged. Light emitting diodes are usually powered from current sources. Oscilloscope circuits use current sources charging a capacitor for generating the sweep. State of the art ICs can provide precise control of current.

The operational amplifier is an excellent current source provided a stable supply voltage is available. To understand the current source it is only necessary to know that an ideal op amp has infinite gain, infinite input impedance and its differential input

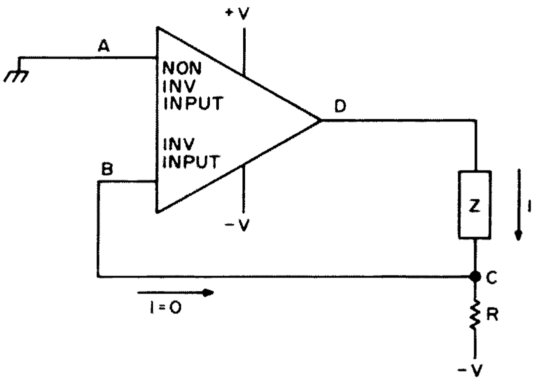

Fig. 1.

voltage is equal to zero. This is not exactly true but practically speaking we can accept it as such. Refer to Fig. 1. Since the voltage at A is zero the voltage at B (and C) must be zero. No current flows from B to C. In other words, the output of the op amp reacts such

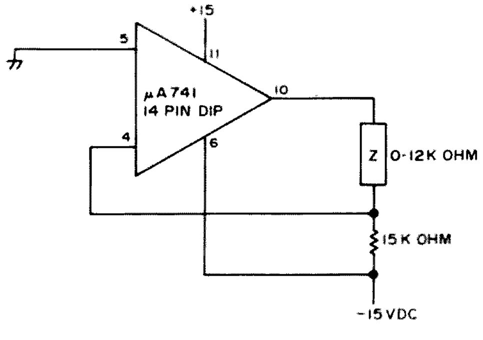

Fig. 2.

that it keeps point C at zero. A constant voltage appears across R, and thus a constant current flow thru it (and Z) regardless of the value of Z. For instance if the supply is ±15V dc and R = 15KΩ then I = 1 mA. The current is constant within 1% or better as Z changes from 0 to 12KΩ or so. Naturally this circuit will work with any op amp.

A µA709 could be used for instance but then frequency compensation capacitors would be needed. The µA741 has the additional advantage of being short circuit protected. To design for a particular current simply let R= V/I. Remember that V is the greatest amount of voltage available to produce current I thru Z. Note: The µA741 will handle up to approximately 25 mA.

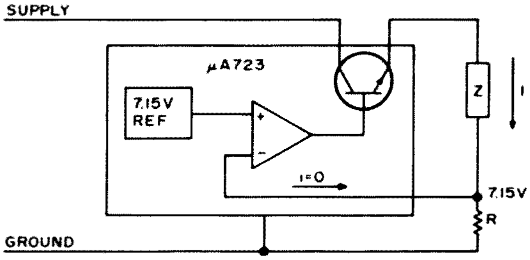

Fig. 3.

A more advanced current source employs a µA723 Fairchild voltage regulator. This circuit does not require a stable voltage supply. The IC has a built in 7.15V reference. Refer to Fig. 3. This simplified diagram shows how the IC acts to hold the voltage across R at 7.15V and thus cause a constant current flow thru Z. In Fig. 4, R =

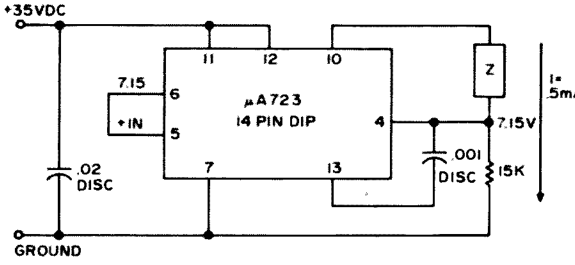

Fig. 4.

15KΩ and I approximately equals .5 mA for Z from 0 to 50KΩ or more. Be careful not to use a supply voltage larger than 40V dc. This is maximum for the µA723. The performance of this circuit is excellent with current constant well within 1%.

. . .K3VKC

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Sunnyvale CA 94088

EASY CALCULATIONS

Timing circuitry using RC circuits are found in a vast variety of applications. Multivibrators, some RC oscillators, electronic switches of various types and many other circuits depend on the state of charge of a capacitor to determine the rate or frequency at which events occur.

In such devices combinations of R and C are selected, usually so that the charge on the capacitor reaches a critical value (such as the cutoff bias for a particular tube) in the desired time after power is applied. In all such applications the time required to reach a selected voltage is a function of the capacity being charged or discharged, the resistance through which the charge or discharge current flows and the percentage of applied voltage selected as the critical voltage. Two formulas express the various relationships involved:

$$(1)\quad t = RC$$

$$(2)\quad VC = E\,(I - \Sigma^{-t} / RC)$$

In these formulas t is time in seconds, R is resistance in Ohms, C is capacitance in Farads, E is applied Voltage in Volts, VC is the instantaneous voltage across the capacitor at time t and Σ is a mathematical constant, 2.718.

In the formula for instantaneous charge across C, it is noted that there are an infinite

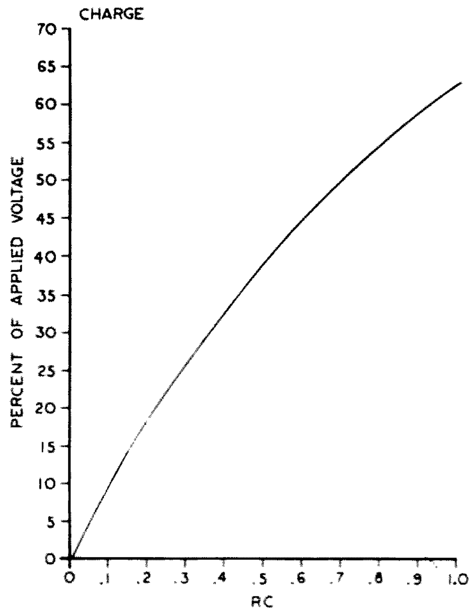


Fig. 1. Percentage of Charge vs. time to 1.0 RC.

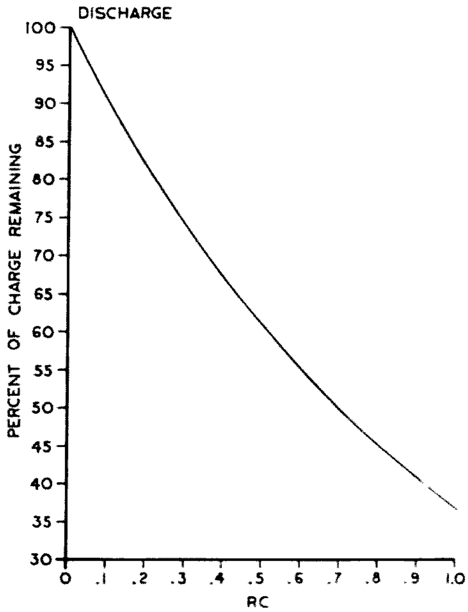
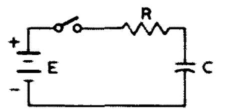


Fig. 2. Percentage of discharge vs. time to 1.0 RC.

number of combinations of R and C which will give the same arithmetical answer. Actual values chosen will depend on relative impedances within the particular circuit.

Generally speaking, in vacuum tube circuits the relatively high impedances have allowed the designer to work toward high voltages across comparatively small capacitances, resulting in time constants of one or more RC. In such instances calculations of VC are made quite simple since it is fairly easy to remember that in RC time the charge on the capacitor reaches 63% of the applied voltage. If the time constant is several times RC the charge reaches approximately the applied voltage.



$V_C = E(1 - \epsilon^{-t/RC})$

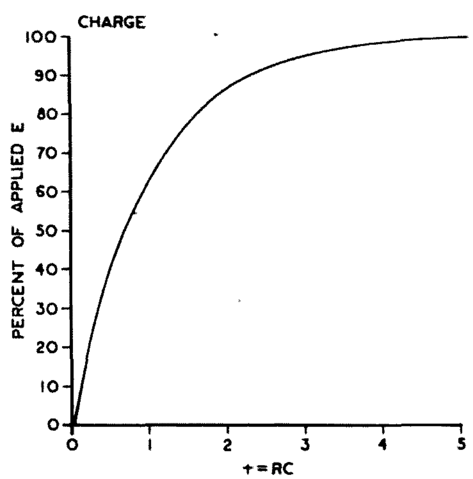


Fig. 3. Percentage of Charge vs. time to 5 RC.

Transistors cause us to actually work with the formula for VC. The considerably lower impedances in transistor circuits result, usually, in much larger capacitors being charged to lower voltages, resulting in time constants which are small fractions of one RC. If a number of values are required the calculations can become slightly tedious. Considerable time and effort can be saved if capacitor charge and discharge curves are carefully plotted. From such curves any of the desired factors can be read to a very acceptable degree of accuracy. Given R, C and E, VC (as a percent of E) can be read for any chosen time, or time (as an increment of RC) can be read for any desired percentage of the full charge.

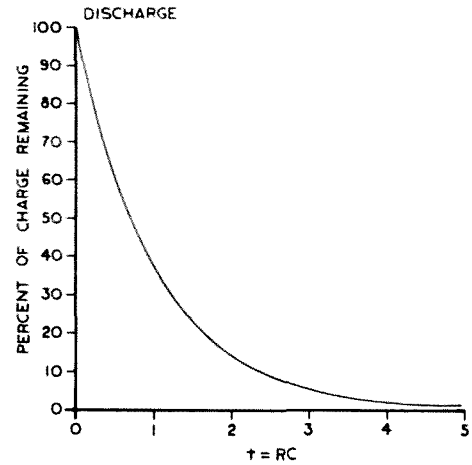


Fig. 4. Percentage of discharge vs. time to 5 RC.

Figures 1 and 2 show percentages of full charge (to 63%) and discharge, plotted against time increments of .1 RC to a total of 1 RC. Figures 3 and 4 are charge and discharge curves to nearly 100% (at 5 x RC), plotted in increments of 1 RC. Figures 2 and 4, the discharge curves, may also be used to determine voltage VR across the charging resistor, and Figures 1 and 3 give VR during the discharge of the capacitor.

EXAMPLES

Example 1

Given a circuit with 10 volts applied to the capacitor through a 10K resistor, it is desired that the voltage across the capacitor reach 3.3 volts in 100 milliseconds. What size capacitor is required?

1. 3.3 volts is 33% of the applied voltage. From the curve in Fig. 1, note that VC = 33% at t = .4 RC.
2. By simple calculations, find that if t = .4 RC, and this figure corresponds to .1 second, with R equal to 10K, C must be 25 μF.

Example 2

Given an RC circuit consisting of a 10 μF capacitor in series with a 100K resistor, with 25 volts applied what will VC be in 550 msec?

1. For 10 μF and 100K, t = 1 second. 550 msec = .55 RC.
2. From the curve in Fig. 1, note that at .55 RC, VC equals 43+ percent of the applied voltage. Simple calculation gives you 10.75 volts across the capacitor.

. . .K6TXR

Bill Hoisington K1CLL
Far Over Farm
Peterborough NH 03458

THE WORLD OF X-BAND

Avalanche and Gunn diode oscillators for the 10,000 to 10,500 MHz ham band

Any amateur who reads at all about radio today has heard of "solid state devices." Beginning with transistors, which are now economical up through the S-Band, 1000 to 3000 MHz, devices are becoming available at prices which are really unbelievable. Like good UHF transistors for 39¢! And X-Band oscillator diodes for $5 to $10! Granted, for the ham, these prices are slightly projected as to quantity and date, but not so very far ahead! UHF transistors at 39¢, so why not X-Band oscillators for $7.50?

At present, X-Band tuners, that is, cute little coax cavities, .64cm I.D., complete with tuning plungers, are available at reasonable cost.

I will therefore describe X-Band oscillators using Avalanche and Gunn diodes, which can be made up, tested, tuned, and operated by amateurs.

The Avalanche Diode Oscillator

This clever little device is really operated as a subminiature "torture chamber" for a silicon diode. You put a little voltage, say 1½V, *carefully* through a resistor in the "forward" direction and it acts like any diode you may be familiar with. It conducts. Reverse the voltage and you get high impedance, and no current. There may be a few microamperes, but forget that.

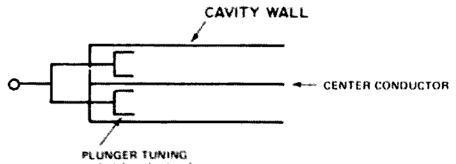


Fig. 1a. The ¼ wave cavity.

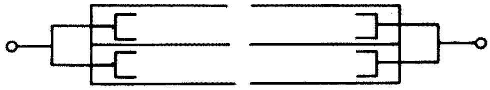


Fig. 1b. Two ¼ wave cavities, "Front to Front."

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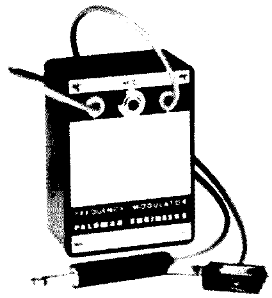

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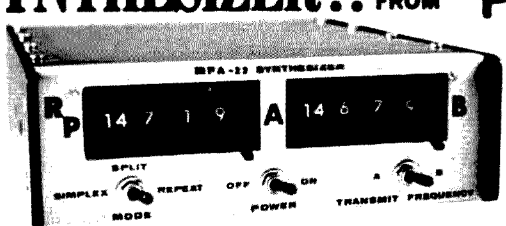

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Now for the "torture-chamber" bit. Applying more voltage in the reverse direction, that is, a lot more, like 50, 60, or 75V, (and don't forget that resistor!) you will reach "breakdown" and current now appears. This is when you get such a high electrical field across the diode junction that a "solid state spark" is now operating, electrons are traveling through the junction of the device at such a high rate of speed they knock out more electrons, etc. etc. This has been likened to an avalanche, hence the name. This is also the mechanism of a lightning stroke, which is also called avalanching. It is also somewhat similar to the gas tube device, only solid state, and the resemblance goes all the way back to the "Good Old Spark Days" of early amateurs. (I worked Chicago from New York with one myself, so enough of that laughter!)

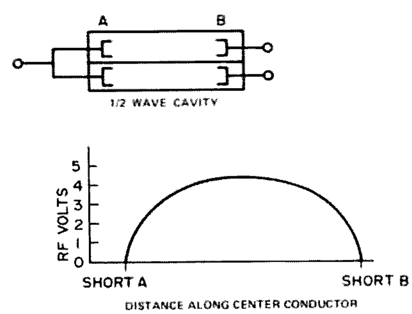

Fig. 1c. The ½ wave cavity.

This internal action creates a negative resistance, which is all you need for an oscillator device, and there you are. As this internal "spark" takes place, the voltage across the resonator (the rf cavity) drops, then builds up on the next half rf cycle, another surge of current occurs a tenth of a nanosecond later, and you're on the air at X-Band. Of course, as mentioned, *everything*, and I do mean everything, has to be right at X-Band, or no go.

The rf impedance (said to be near 1Ω!) is much lower than that of transistors, whose impedance is already much lower than that of tubes (remember, those funny large bottle-like things, of glass, that had "elements" inside that you could *see*?). This low impedance is handled by inserting

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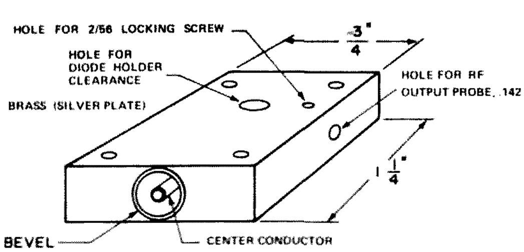

Fig. 2a. Main body of the X-Band cavity.

the diode almost at the end of the half-wave resonator, close to one of the shorted ends. Do not let the idea of oscillations across a .64cm of brass bother you. It works!

How To Do It. Tuner Schematic

So much for the theory, now let's make it oscillate in the 10,000 to 10,500 MHz ham band.

Figure 1 shows the development of a half-wave cavity of the coaxial type, for X-Band, first with one quarter-wave, then with two quarter-waves "front to front," and then with the two together forming a half-wave unit. This has great advantages over the quarter-wave cavities in Q and also in the resistance to loading. This loading business is simply the shortening of a quarter-wave line, or rod, or center conductor of a coax cavity, etc., when a device is connected to it. It will pay you at this point to get a 10¢ ruler at the Five and Dime store. Be sure and get the plastic kind that has millimeters and centimeters along one side and inches along the other. You will find them readily displayed in front of you the wavelength of, for example, S-Band at 3000 MHz or 10 centimeters; C-Band at 5000 MHz or 6 centimeters; C-Band at 6000 MHz or 5 centimeters, and X-Band at 10,000 MHz or 3 centimeters. This latter is of course also 30 millimeters, which is easier to work with. The actual use of this little ruler as a wavemeter is described later.

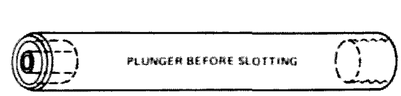

Fig. 2b. Tuning plunger before cutting the fingers.

As you will see, the quarter wave at X-band is getting pretty short; in fact on that little 10¢ wavemeter it is only 7½ millimeters, which is close to 5/16 in.

So how can you hook up a "device" to such a tuner? It isn't easy, as many high-priced microwave engineers have found out! But with a half-wave resonator it can be done, and have some tuning available as well. One I have here tunes from 9000 to 12,000 MHz.

Mechanical Details

Figure 2 shows you how to go about it. It is possible to make these pieces of hardware yourself, but I advise you not to unless you're a good man at a good lathe.

There is a good rule to follow at X-Band, "everything must be just so" or it won't work. The cavity must be good, the device good, each of the fingers of the sliding shorts must be making good contact, the output probe must be loosely coupled, at least to start with, etc.

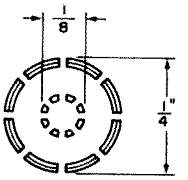

Fig. 2c. Plunger end view details.

The Cavity

The main body of the cavity, Fig. 2A, should be of brass, silver-plated inside and out. The .64cm hole is bevelled at the edges to allow insertion of the .64cm OD tuning plunger fingers, Fig. 2B, which are bent outwards to assure good contact with the inside of the ¼ in. ID cavity. The inner conductor is bevelled also, to allow the inner fingers of the tuning plunger to slip over it. These inner fingers are of course sprung inwards during fabrication to assure good contact during operation.

Tuning Plunger

The tuning plunger fingers, Fig. 2B, are of course very important. I have had some brand new ones (unfortunately not made of tempered beryllium copper) which were not too good, making and breaking contact as I moved the tuning plunger handle, with the oscillator going on and off. Then again I have a twenty-five year old World War II oscillator at 2000 MHz which had very springy silver-plated plunger fingers and still puts out 10W today!

Every finger of the plunger should make good contact!

In case you wish to try to make this item, here are the details. Figure 2B shows the .64cm rod with the .64 cm deep cut before the fingers are sawed out. The remaining walls should be as thin as possible for maximum springiness.

Figure 2C shows an end view of the plunger after using a fine jeweller's saw to cut out the fingers. Figure 2D shows a side view of the outside fingers only. The uncut portion of the plunger should be well under .64 cm in order to slide into the cavity without friction. It is drilled out in the center to over .32cm to allow it to slip

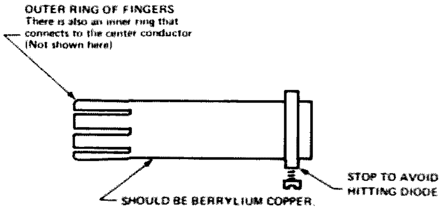

Fig. 2d. Side view of the plunger.

over the center rod without friction.

The outer fingers are bent out to contact the cavity inner wall, and the inside fingers are bent inwards to contact the .32 cm inner rod.

The plunger body should be longer than the cavity in order to be able to tap the "no finger" end, and insert a screw for a tuning handle to push the plunger in and out. A stop should be provided to avoid going too far with the fingers into the cavity and hitting the diode.

Center Conductor

This piece is based on .64cm stock, brass or copper, or it can be turned down from

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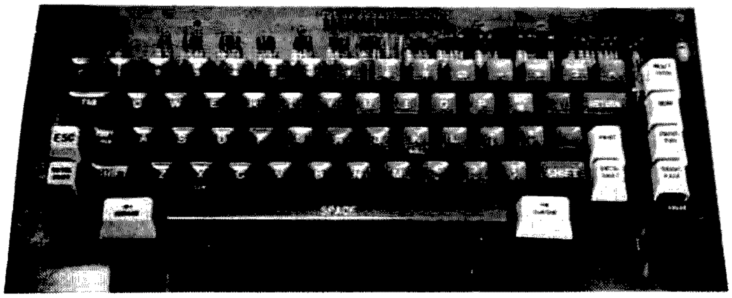

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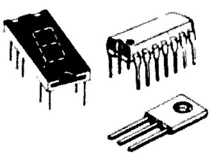

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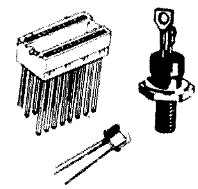

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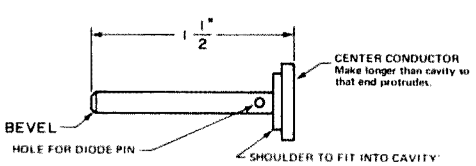

Fig. 2e. Center conductor of the cavity.

larger stock, again, if you are a good man on a good lathe. Having its end bevelled and protruding from the open end of the cavity body makes it easier to insert the plunger over this center rod and into the cavity without bending the fingers out of contact.

It should be silver plated also, and have a hole for the diode pin. This hole should be positioned so the large flange on the diode does not quite touch the disk on the end of the center rod. See also Fig. 4.

Rf Output Probe

The rf output probe is made up of semi-rigid coax of about .141 OD (one hundred and forty-one mils). Cut off about .64cm of the outer conductor with a jeweller's saw. Then cut off all but about 1.6 cm. of the insulation now exposed. (See Fig. 2F.) Solder a copper tab onto the center conductor and trim it to a shade less than .141 so that it can be easily inserted into the rf probe hole in the thick side of the cavity. Note that two walls of the cavity are thick, to allow for probe cable holding and locking with a 2/56 set screw. The other two walls of the cavity are very thin, for rf reasons outlined below.

X-Band Capacitor

A bypass capacitor for the ham X-Band cannot be purchased, as far as I know. But don't let that bother you, because you can make one yourself, as in Fig. 3A, if you pay attention to materials and shape. Shape at UHF frequencies and at X-Band is

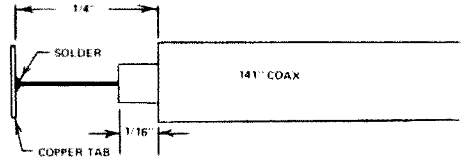

Fig. 2f. Rf output probe details.

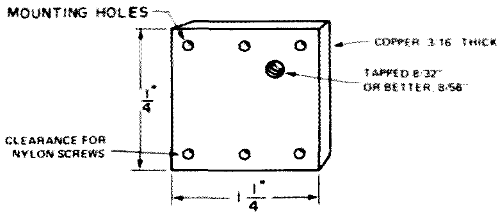

Fig. 3a. Details of the diode holder mount and bypass capacitor.

perhaps 90% of the battle. Look carefully at Fig. 4. One end of the diode makes contact with the center conductor, and the other end is held in the four teeth of the copper 8/32 diode holder. Note that the opening, which does not touch the diode, is in the thin wall of the cavity. The capacitor can be seen acting as part of, or a continuation of, this thin wall (through the 2 mil insulation) so that the end of the diode with its holder screwed tightly, but not tight enough to break the ceramic of the diode into the capacitor plate, is only a small fraction of a wavelength at X-Band from the cavity wall itself. The rf on the inner wall of the cavity should flow down the inner wall, across the capacitor, and onto the diode m what might be called a continuous fashion. If this is done correctly no rf will be found on the outside of the capacitor plate, and the dc connection may be made directly to the *outside* of the plate without choke coil or other bypass. The capacity of this item may be anything, as long as it is *over* some 50 pF.

The insulation may be mica, good clear grade, or fiberglass sheet, and should be around 2 to 3 mils thick. If thicker, the bypass action will suffer, and if less, there is risk of dust puncture and voltage breakdown.

Needless to say, clean everything well. All burrs and metal particles should be removed, and both surfaces should be polished flat with crocus cloth. And don't forget those nylon bolts!

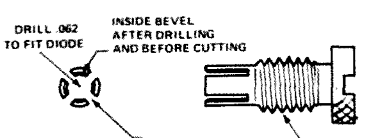

Fig. 3b. The diode holder is a modified machine screw.

Some More Mechanical Details

Referring again to Fig. 3A, four nylon bolts should be used to fasten this item to the main cavity body. After careful insertion of the diode and its holder, to position the plate on the cavity, mark two holes first and drill through the cavity. When bolted, mark and drill the other two holes. Of course if you are a super-machinist, do them all at once. Remember, the diode or it's holder must *not* touch the cavity body. If it does, the capacitor is shorted and there will be no dc on the diode. Provide a small soldering lug under one of the nylon bolts for the dc connection, and two mounting holes out on the side as shown in Figs. 5A and 5B.

Diode Holder

The diode holder is of course important. Remember that copper conducts heat some

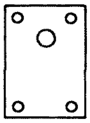

Fig. 3c. The bypass insulation should be fairly thin.

four times better than brass, and that heat is a bulk effect, so provide thickness as well as surface. If you only want a few milliwatts of rf for a test oscillator or an LO (local oscillator), you need not worry too much about heat-sinking, but if you want to get toward 100 mW (*those* diodes cost more!) or over, pay attention to that heat! And get rid of it, via the copper diode holder, the copper capacitor plate, and a chassis plate or wall. Figure 5B shows an extra plate or wall for heat-sinking in case you have to isolate from ground, as perhaps in a car. Again this is only for power.

Some Mechanical Details

This is a small item, so do it right the first time. See Fig. 3B. Select a good clean 8/32 brass machine screw, or copper, if you're going for power. You may have to

turn down a copper rod for this because copper machine screws are no longer found in every hardware store.

Check the diameter of the small end pin of the diode. The usual diameter is 1.6 cm. Drill out snug, bevel, and then make two or four saw cuts with a fine jeweller's saw. You might have to repeat, so get more than one screw on hand when you start. Clean very carefully and bend to hold the diode so that it can be inserted and taken out by hand.

Oscillator Assembly and Preliminary Tests

The whole unit, Fig. 4, after assembly and bolting together with the nylon screws, should be tested first for a capacitor short and then for diode conduction with an ohmmeter. With the avalanche diode in-

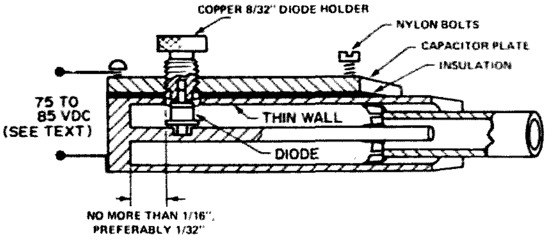

Fig. 4. Cutaway view of the completed cavity.

serted it should read low, around a few tens of ohms in the forward direction, and high in the reverse direction. Be sure the mica or fiberglass sheet extends beyond the copper capacitor plate so you see the sheet, and make sure that no metallic grains or dust come between the plate and the cavity body. Remember, there is only about two mils of thickness there, and this is easily punctured by metallic dust grains.

Special Notice On Polarity and Heat-Sinking

This point should be planned ahead, as you will see. In general it is handy to have the cavity body at ground dc voltage because the rf output cable outer conductor will then be at dc ground also.

However, some diode manufacturers have the diode chip reversed in polarity

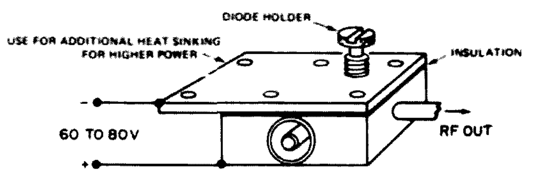

Fig. 5a. Top view of the bypass capacitor.

from others. In 1968 most of them standardized on putting the main body of the chip in the *small* end of the double prong package. This is the end that must use the copper heat-sinking diode holder, so the polarity is thus determined, with the negative voltage on the heat-sink, putting the positive on the output cable. If you are using a 90V B battery it doesn't matter. If you are using a car battery and don't ground the antenna cable, still all right. However, some lab power supplies and some rf power meters use a common ground. Then it will matter.

Supply Voltage and Oscillation

You can use dry cells, such as two 45V batteries, or one 90V unit, with a variable resistor in series with perhaps a 1000Ω resistor (see also Figs. 5A and 5B). A transistor dc to dc converter or an ac supply may be used to get the voltage needed, which will be around 75V or so.

Always start in slowly with milliameter in series, and voltmeter across the *diode* connections, as in Fig. 5B. Later, when everything is tuned up okay, you can use a switch. At around 50–60V or so, depending on the diode, a few mils of current will start to flow, increasing as you turn up the voltage. At somewhere between 10 and 20 mA, again depending on the diode – and also on the oscillator circuit and rf loading

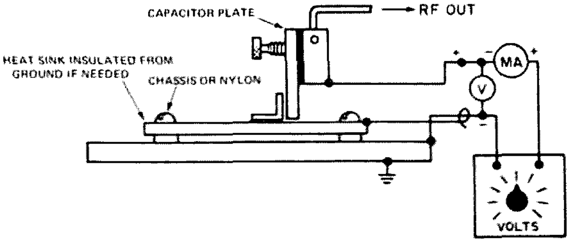

Fig. 5b. Use a variable supply for the smoke test.

of course – oscillations will start. Do not go over the manufacturer's rating for volts and mils (watts, that is).

Efficiency

Do not expect more than 1% or so in the efficiency department. For example, 75V at 20 mA equals 1500 mW of dc input power, and 15 mW of rf out! This is it!

Rf Out

So now you're on the air on X-Band. A simple off-center dipole and reflector is shown in Fig. 6A. This does radiate, after a fashion, and it will get you out into the room, anyway. Get some paraffin wax, like mother (or maybe grandmother!) used on top of jelly jars, and melt it down and pour yourself some lens antennas, using hemispheres of old or new rubber balls cut in half as molds. Start with a few centimeters in diameter, say one of 7.62 cm and one of 15.24 cm. Look out for fire with that hot wax! At X-Band a 43.18 cm lens has a

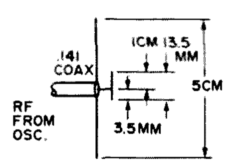

Fig. 6a. A simple dipole and reflector for X-Band.

theoretical gain of 33 dB, and I have one here that I measured at 29 dB gain. A lens antenna has the extremely important feature of producing, without scanning, either mechanical or electronic, an image on a microwave retina in back of the lens, allowing you to see through fog if you arrange things right! Most lens antennas as used for amateur work are sections of spheres, not parabolic.

Figure 6B shows a lens antenna assembly detail. Don't forget, *gain is equal to directivity*. This goes for any beam and all the other ham bands, too!

X-Band Detector

This of course can get to be a lengthy subject, so we will confine ourselves for the moment to a tried and proven design, now some 15 years old in my shack, which uses a 1N23 type cartridge, World War II type, which almost every ham has on hand. See Fig. 7A.

The small one and a .64cmdiameter lens was cast in a ping-pong ball and the shell left on. Cut .64 cm off the bottom and cement with more wax to the base plate. Figure 7B shows detailed dimensions, Fig. 7C has details of the brass block, and Fig. 7D shows a 12.7 cm lens detail.

I use this "space detector" in back of larger lenses, also. Dc will be found at the output terminals using a 50 μA meter, and also af providing the transmitter is modulated. This is another story, along with a good do-it-yourself superhet receiver using a high Q tuneable mixer cavity, for real DX work at 10,000 MHz!

Without amplification and using a 12.7 or 15.24 cm lens on the transmitter and another on the detector, you can expect meter movement around a table-top or the room, for some intriguing experiments, antenna tests, etc.

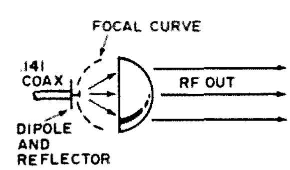

Fig. 6b. A high performance lens antenna assembly.

The 10¢ Wavemeter For Microwaves – It Works!

Practically every stationery store in the USA sells little plastic rulers with 150 millimeters on one edge. There is also a set of "natural numbers" that go as follows, for calculation of frequency vs. wavelength. Ones go with threes, fives with sixes, etc., so that 10,000 MHz equals 3 centimeters, or 30 millimeters, 3000 MHz equals 10 centimeters or 100 millimeters, 5000 MHz equals 6 cm, and 6000 MHz equals 5 cm.

This sort of thing is very useful at the amateur band of 10,000 MHz, where a half-wave can be seen directly on that little wavemeter as 15 millimeters, and the quarter-wave as 7½ mm.

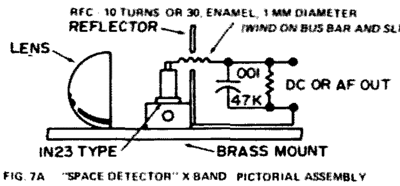

Fig. 7a. The space detector for X-Band.

Figure 8 shows an experimental setup for checking wavelength (frequency!). T transmits to R, registering perhaps half scale on the 50 μA meter, and ST, the semi-transparent movable SW indicator, is interposed. I have found .48 cm beaverboard with aluminum spray paint on one side, to work well for this X-Band "transparency." I just clamp a 15.24cm square in a small drill vise, tape the ruler to the table-top, and proceed. As some rf is reflected and some passes through ST, standing waves are created in the medium (air). On moving ST back and forth between T and R, a maximum will be found on the meter at every half wavelength. Take an average of several readings for security. For example, on the 10¢ millimeter ruler scale you find maximums (use minimums if you're contrary) at 45, 59, 65, and 81 millimeters. Add up the half-wave spacings thus found by moving the drill vise along the ruler, which are 14, 15, and 16 millimeters, divide by three for the average, and you get 15 millimeters. This is the half-wavelength, so multiply by two and you get a full wave of 30 millimeters. You are thus on the low edge of the 10,000 to 10,500 MHz ham band. So that's it for avalanche diodes. Have fun!

The Gunn Diodes

The Gunn diode comes in the same tiny package as the avalanche diode, but oper-

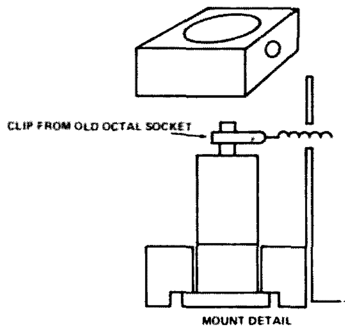

Fig. 7c. Brass mount for the 1N23 diode.

ates more like a true negative resistance device, showing this characteristic even at dc. It also takes less voltage, around 10 instead of 70 to 80, but the efficiency dc to rf is about the same, as the millliamps are now up around 100. It has advantages and disadvantages, compared to the avalanche diode. It is less noisy, making it more suitable for local oscillator service at X-Band, but, at least for the present, it costs more (as much as three times more) and does not have the rf output of the avalanche.

The rf impedance of these Gunn diodes is higher than the avalanche diode, near 10Ω according to some "informed sources."

At any rate, it will operate at a point nearer the center of the center conductor of the X-Band cavity. This point is detailed in Fig. 9. Aside from that point and the dc voltage, other considerations previously considered for the avalanche diode can be the same.

Voltage Supply For The Gunn Diode

As mentioned, this is a nice feature of the Gunn. You start in, using a variable

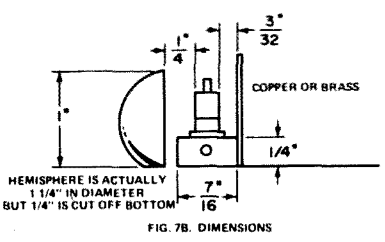

Fig. 7b. Dimensions of the X-Band detector.

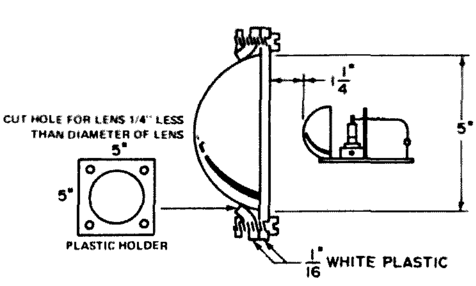

Fig. 7d. Detail of the large lens.

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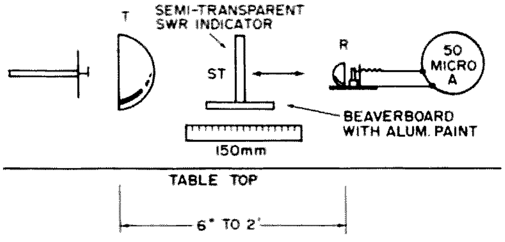

Fig. 8. Setup for checking wavelength.

12V (maximum) supply and the mils will climb to over 100, and then suddenly drop to a lower figure, say around 80 mA. This is because of the dc negative resistance action. It does not necessarily mean that the diode is oscillating, but this is the place where it will, if everything is okay rf-wise!

If the circuit is correct, X-Band oscillations will occur and can be tuned by moving the plunger in or out.

Heat-sinking is important here also, as this device is made of Gallium Arsenide, a compound that is more heat sensitive than the silicon of the avalanche diode, so watch the temperature when operating continuously. Incidentally, cooling the oscillator to below zero sometimes boosts the power by a factor of as much as two.

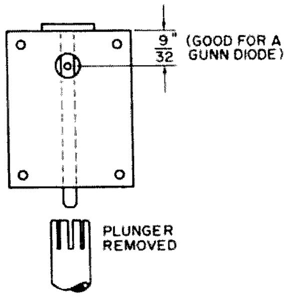

Fig. 9. Cavity modification for a Gunn diode.

For a light, hand-carried rig, seven type C flashlight batteries provide a nice operating voltage for most Gunns, dropping to 10V (maybe 9½ for some batteries) under the near 100 mA of current. For good continuous service, use two 6V lantern batteries in series for 12V, with a resistor. These batteries generally carry a maximum rating of 5 00 mils, so you're all set. A good low voltage ac supply will of course do fine on the bench.

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AN IC MIKE PREAMP THAT DOUBLES AS A TONE GENERATOR

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The preamp herein described is built around one of the new dual op amps that is available in the "half-DIP" form – a dual-inline package with only eight pins. The Signetics N5558V is only \$2.00 in single quantities, making its internal op amps \$1.00 apiece. The Signetics N5558V is also available from Motorola as the MC1458CP2, from National Semiconductor as the LM1458, and from Texas Instruments as the SN72558P. The price of the competitor's types will probably be similar to that of the Signetics N5558V.

The first half of the N5558V is used as a gain stage to increase the voltage level of the output of the carbon mike-current source combination, or as a Wien Bridge oscillator.

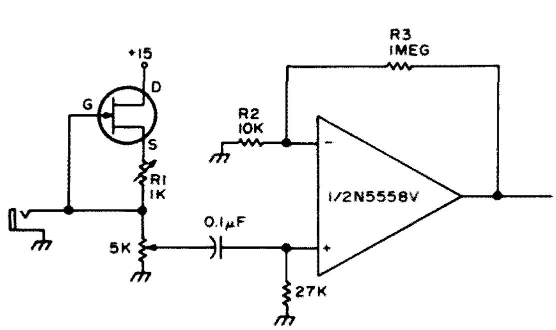

Fig. 1. Carbon mike preamp (equivalent circuit).

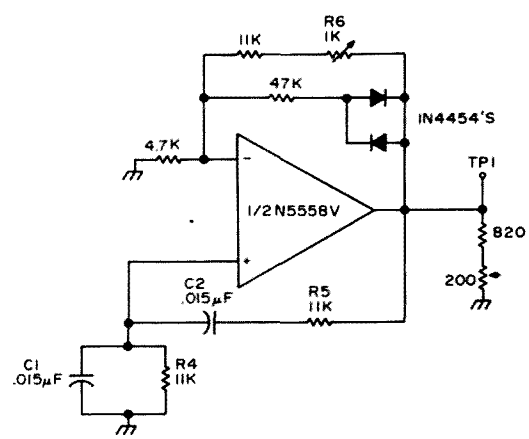

Fig. 2. Test tone generator (equivalent circuit).

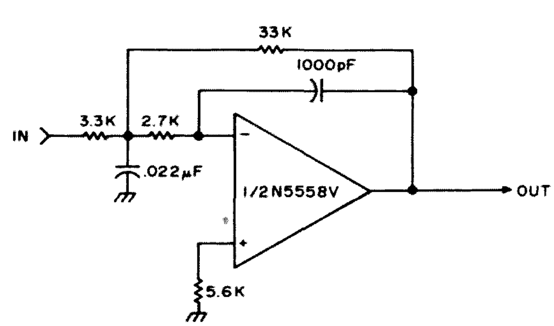

Fig. 3. Active low pass filter.

Whether this stage performs as an audio amplifier or an audio oscillator depends on which way S1 is thrown. With S1 in the

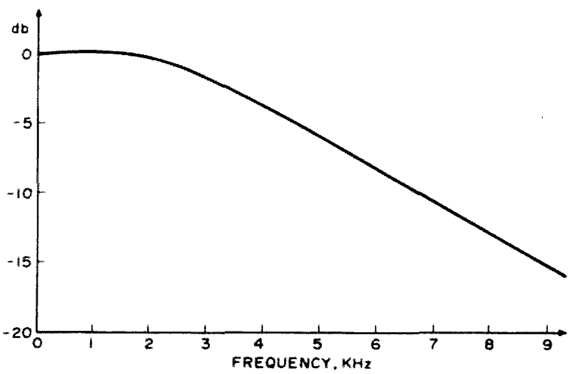

Fig. 4. Frequency response of active low-pass filter.

"mike" position, the equivalent circuit is as shown in Fig. 1. Note that we use an FET here as a constant-current source; the constant current through the variable resistance of the carbon mike provides an audio voltage. The amount of constant current is adjustable by means of R1; it is variable from the I(dss) of the FET to some lower value. In a typical case, I(dss) was 7.6 mA and the amount of constant current was variable from 7.6 mA to 1.6 mA. As with most FET's, the I(dss) of the HEP 802 has a rather loose spec (2–20 mA). The gain of the first op amp as an amplifier is set by the ratio of R3 to R2: 1 Meg/10K = 100.

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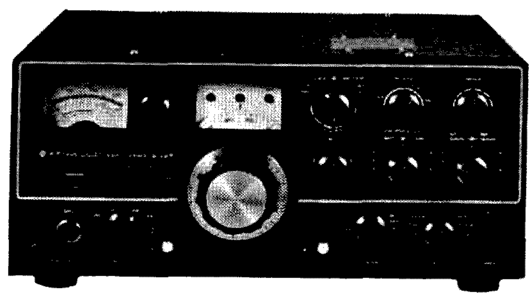

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When S1 is in the "tone" position, the first op amp becomes a Wien Bridge oscillator. The Wien Bridge oscillator is probably the best known oscillator for generating pure sine waves; it is the form used in most laboratory audio generators. Although this circuit is rather a simplified one of the Wien

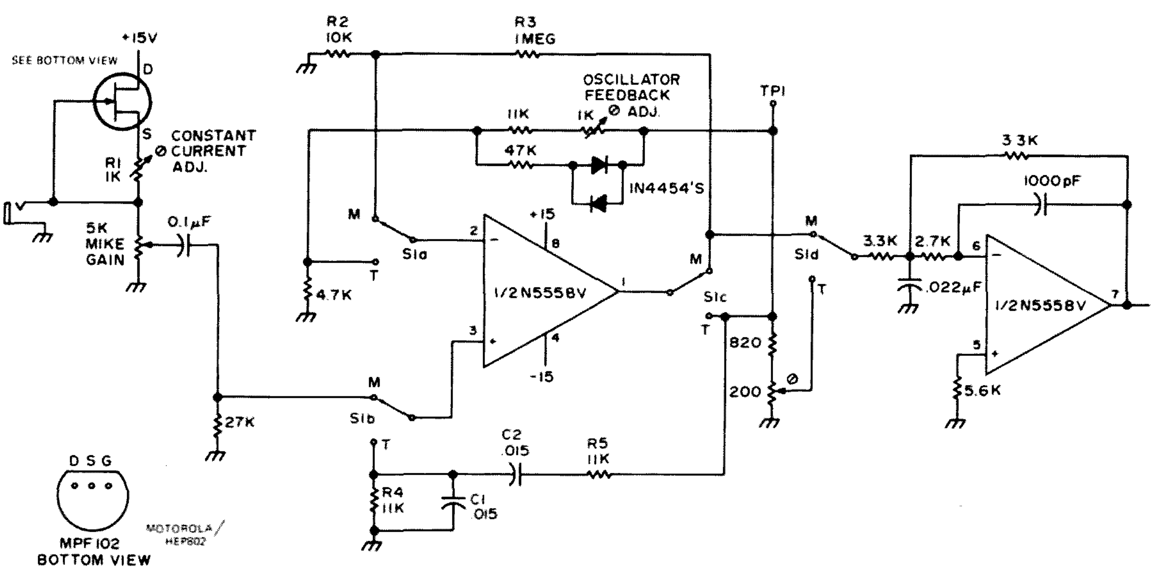
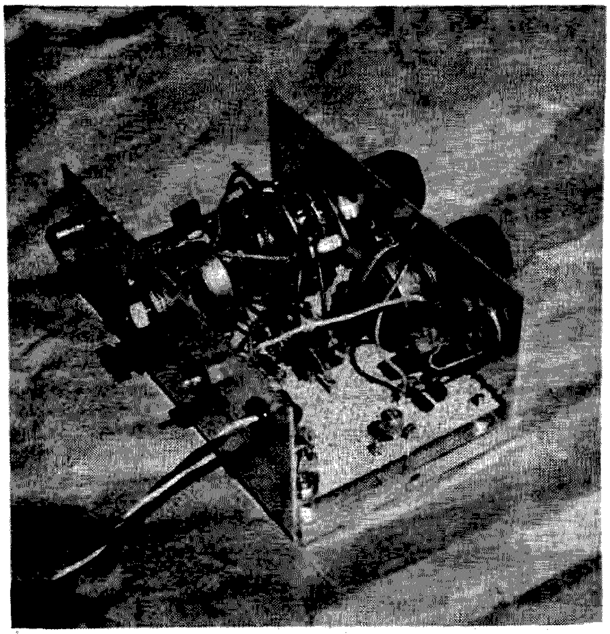


Fig. 5. Combination preamp and tone generator.



Topside view of the inside of the IC Mike Preamp.

Bridge, it is capable of producing a sine wave whose largest harmonic component (the 3rd harmonic) is more than 50 dB down from the fundamental. The capacitors C1 and C2 and the resistors R4 and R5 are the frequency-determining components in this oscillator. The feedback non-linear control element in the classic Wien Bridge oscillator was a light bulb. This circuit utilizes a pair of silicon signal diodes for the non-linear control element. It might appear that the diodes would cause severe distortion of the waveform by clipping, but this is not the case. The 47K resistor in series with the diode pair "softens" their clipping action, so that the diodes provide stability without severe distortion. In operation, R6 is adjusted until the output of the oscillator is 10V peak-to-peak (at T.P. 1).

Regardless of whether the first op amp is used as a mike preamp or as an audio tone generator, the second op amp always functions as an active low-pass filter. The cutoff frequency of this filter is set at 3.3 kHz. Although it uses no inductors, the rolloff of this active filter is 12 dB per octave. The equivalent circuit of the active low-pass filter is shown in Fig. 3, and its frequency response in Fig. 4. Also, unlike a conventional low-pass filter, the active filter may be designed to have voltage gain. This particular filter has a voltage gain of 10.

Figure 5 shows the complete circuit of the preamp-tone generator. It was constructed in an LMB No. 136 box chassis, as a subassembly of a larger SSB system. The unit used conventional- sized pots and switches, and could have been made considerably smaller if miniature types had been substituted. Note that the wire exiting through the rear of the box through a 1000 pF feedthrough capacitor is simply the connection to the "tip" of the PL68/U style jack (going to the mike button for control purposes). Most of the circuit was wired on a 2-7/8 x 4-3/4 piece of multihole board using Vector T28 pins. The layout is not critical, but high-gain audio amplifier wiring practices should be observed.

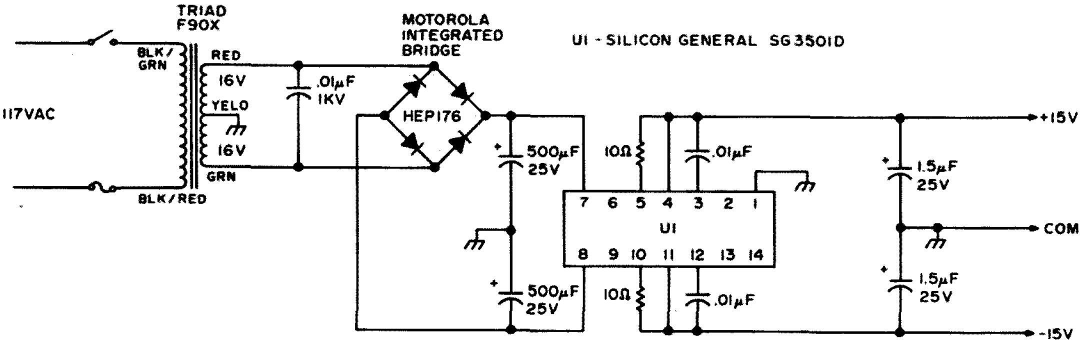


Fig. 6. Power supply for sine wave oscillator.

Since the preamp tone generator is to be part of a larger system, no power supply was built into it. However, if this unit is the only part of your system that requires ±15 volts, the simple regulated supply shown in Fig. 6 is quite adequate to operate it.

...W6GXN

Robert M. Harkey W4CUG
3234A Hamilton Street
Hill AFB UT 84406

INCREASED SPEED FOR THE K2OAW FREQUENCY COUNTER

Beginning in the May 1972 issue of *73*, K2OAW presented a very complete series of articles on the construction of a frequency counter with a low frequency (0–20 MHz) input and a divide-by-10 prescaler capable of extending the upper frequency limit to 300 MHz. The counter appeared to be just what I needed. In fact I wrote to K2OAW and he generously forwarded a copy of the circuit board layout in advance of publication of the next article in *73*. The counter was built using mostly surplus ICs and junk box parts, and worked the first time it was plugged in. By sorting the ICs according to speed, I was able to obtain a stable upper frequency limit of 32 MHz in the low frequency position. I have not yet added the prescaler ICs since I had no immediate need for VHF capability, but extension of the low frequency limit did intrigue me – especially since I had heard of Heathkit counters that would go to 40 MHz. Much experimentation was accomplished on the front end of the counter, including the 40673, the 7413 and the 7400 input selector. Maximum attainable speed remained in the 32 to 34 MHz range.

The main problem appeared to stem from the limited speed of the 7473 flip-flop which comprises the divide-by-two function of the first decade. Simultaneously with my discovery of the apparent problem with the 7473, low cost Schotty TTL ICs became available from some of the surplus companies. (They are available from Solid State Systems, P.O. Box 773, Columbia MO 65201.) A 74S73 flip-flop was obtained and plugged into the IC5 position on the circuit board and things started to happen. Using a four turn wire loop on the counter input and a grid dip oscillator as a signal source, the counter's upper limit was found to be 62 MHz! To say the least, I was flabbergasted. Subsequent checks proved that the initial test was not a fluke and the counter was now stable from 20 Hz (the lower limit of my test equipment) to better than 60 MHz.

The next limiting factor on the upper frequency limit appears either to be the 7413 Schmitt trigger or the divide-by-five function of the 7490 in the first decade. Further experimentation is under way on replacement of the 7490 with a 74196 or some other high speed device. I'm also hopeful that a Schottky 7413 will be introduced. However, a friend of mine (1Lt Dan Wright) has operated a 74S00 Schottky IC in a Schmitt trigger configuration with operating limits in excess of 100 MHz and maybe this setup can be used to replace the 7413. Anyway, there are tremendous possibilities and, who knows, maybe I'll never install the 95H90 prescaler.

My sincere thanks to friends who have added ideas and provided encouragement to my experimentation. They include 1Lt Dan Wright, 1Lt Cecil Lockett and 1Lt Bruce McIntire. Most of all, thanks to Pete Stark K2OAW, for his design and article on the counter.

. . .W4CUG

William P. Turner WA0ABI
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Saint Peters MO 63376

ABI NOTES

Ten tips for the homebrewer who seeks homebrew answers to those homebrew problems.

CHEAP POWER SUPPLY FOR A CRT

Recently, while in the process of building a small monitor scope, I had need of a high voltage source in the range of 1000V. I found the available transformers too large or too expensive for the project I had in mind. As is often the case, the solution was in the junkbox. I found two transformers of the "TV booster" type which provided slightly over 1000V. This is sufficient for most 5.08, 7.62, and 13.7 cm. CRTs. By now you are wondering how to get 1000V from two transformers with 125V secondaries. The answer is simple. T1

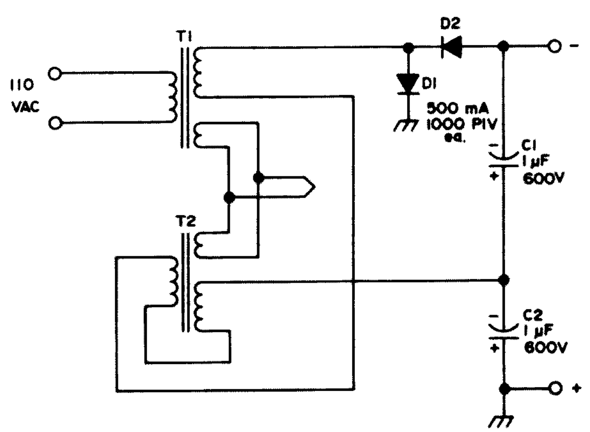


Fig. 1. CRT power supply.

is hooked up in the normal manner, primary to 117V ac and the 6.3V winding to the CRT heater. The 6.3V winding of T2 is used as a primary and is connected in parallel with the CRT heater. The normal primary and the high voltage secondary plus the remaining winding of T1 are phased series aiding. These windings in series produce approximately 367V ac which is doubled by D1-D2 and C1-C2. A CRT requires only a few microamperes, so the filter will charge to very nearly peak or 367 x 2.8 or about 1027V dc. Try it, it works beautifully.

FREE TRANSFORMERS

I have seen several articles on the fine points of obtaining parts from defunct TVs. These all follow the time honored course of power transformers, controls and other obvious parts. I have yet to see mentioned the possibilities in audio output transformers and vertical oscillator and output transformers.

As you may know, the vertical deflection circuits of a TV operate at 60 Hz, is it not logical to put these transformers to use in power line 60 Hz applications? Audio transformers too are adaptable to the same type operation.

One word of caution: Many vertical output transformers are actually autotransformers and as such should not be used without isolation between it and the power line.

After removal from the chassis, determine what you have by checking the windings with an ohmeter, then apply line voltage to the high resistance winding and measure the secondary voltage. Record the ratio (110:5.5

etc.) and the lead configuration on the transformer and file for future reference. A rough estimate of the current capability may be made by comparison to known transformers.

In order to illustrate the uses to which these transformers may be put, I will give some examples from my own experience.

1. Ratio 110:1.8 isolated vertical output, used with a voltage doubler to supply power to a transistorized frequency standard.
2. Ratio 110:10 isolated vertical output, used as source for a home brew "high intensity" light.
3. Ratio 110:4.6 autotransformer vertical output, used to furnish bias in a transceiver power supply. Low voltage side connected to one half of the filament transformer secondary.
4. Ratio 110:12 isolated audio output, used as filament supply for a two tube amplifier.
5. Ratio 110:26 isolated vertical oscillator, rectified and used to supply 28V dc to two surplus coax relays.

These are just a few of the many uses to which these free transformers may be put.

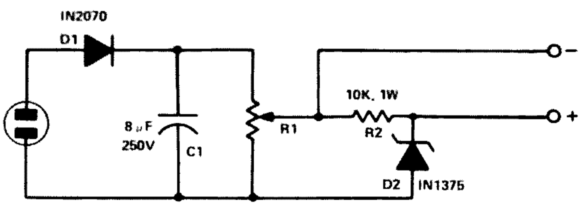
EXPANDED RANGE LINE VOLTAGE METER

An expanded range meter, as you are no doubt aware, magnifies a selected segment of voltages so that readings may be taken with greater accuracy and fluctuations will cover a greater percentage of the meter arc, making them more easily detectable. On a typical VOM, such as the Simpson model 260, 5V on the 250V range covers one scale division; with this adaptor the same 5V is spread over 5 divisions, making the reading of one volt simple and .1V not impossible.

The principle involved is quite simple. The line voltage is applied to D1, the resulting dc is filtered by C1, which charges to peak. Resistor R1 is a voltage divider which delivers the equivalent of the rms voltage to D2, a 100V zener diode, through current limiting resistor R2. Under 100V, insufficient voltage is developed between the slider of R1 and common to allow D2 to conduct, therefore no voltage is developed across R2. As the applied voltage is increased, D2 conducts and regulates at 100V. Any voltage in excess of 100 is developed across R2. Any voltmeter of 1000Ω per volt or more may be used to read this voltage.

This gadget is installed in a minibox with a line cord attached for connection to the ac line and tip jacks for the external meter. If desired, a larger case could be used and a meter and multiplier resistor permanently installed.

Calibration is simple. Measure the ac line with a meter of known accuracy, then adjust R1 to produce this reading minus 100 on a low dc scale of your external meter. The line voltage will be the meter reading plus 100V. In the case of very low line voltage, a low scale may be used. For example: 105V would give a center scale reading on the 10V scale. If the line voltage exceeds 110V it will be necessary to switch to the 25V range on the external meter.



R1 = 15K, 5W WIREWOUND POTENTIOMETER

I bought all parts for this project from a mail order house at a cost of less than $3. While this unit doesn't have the absolute accuracy of some commercial units, it will prove very useful in checking for overloaded wiring, and insufficient voltage to linears, motors, air-conditioners, etc.

SPEED UP KIT BUILDING

As a new owner of a piece of kit equipment, you are naturally in rather a hurry to get it together and operating. The building process is bad enough alone, but when the usual hectic search for the proper part for each construction step is added, the torment becomes unbearable.

One easy way to save time when building a kit is to sort out all small components into their respective types and values before beginning. Not an unusual idea, you say? Correct, but here is a twist: Stick each group of identical parts to a section of wide

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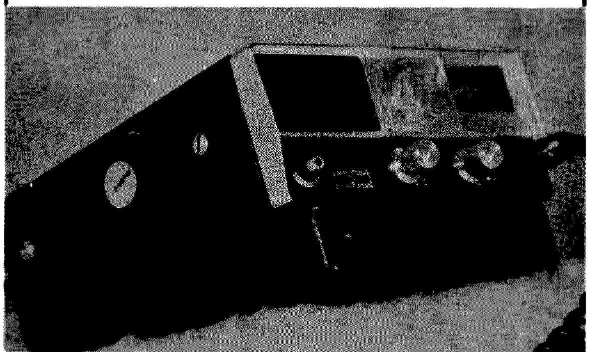

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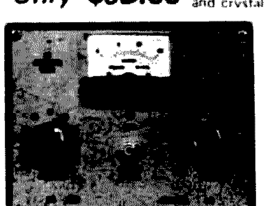

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masking tape. Not only will the proper value be close at hand when you need it, but when you put things away after a session, the components will stay stuck to the tape and save a re-sorting job when you start again. This also keeps the smaller pieces from falling on the floor and getting lost or stepped on.

Parts which come packed in see-through bags with an identification number on the bag are best left in the bag and the bag stapled to a sheet of paper with other similar parts.

LOW COST CAPACITOR COVERS

More often than not the high voltage supply for a modern transceiver or linear uses several capacitors in series, all capacitor cans, except the one at the cold end, above ground. This is an inexpensive way of eliminating bulky high voltage capacitors. Home brew design has followed suit to a large extent.

There is a distinct disadvantage to having the capacitor cans above ground. The cans are hot electrically and present a serious safety hazard if not covered in some manner. Having built a 3000 volt power supply and not desiring to build a metal cage, I consulted catalogs in hopes of finding an inexpensive Kraft paper tube of the type so often seen in TVs. No luck, not only were they expensive, but they didn't come in the required length.

Why not cut lengths of cardboard tube from that most noble of paper products? Because it's too large, that's why. But there are ways around that, and besides we need protection on the top of the can anyway. How about painting the tube flat black to obscure its ancestry, slipping it over the capacitor and sealing it in place and covering the top with silicone rubber (black if possible). It works fine and costs almost nothing.

POTENTIOMETER REPAIR

Any carbon control which is adjusted often or which is subjected to dc flow will soon become erratic in operation and require

replacement. I was recently faced with this problem in conjunction with a small imported AM/FM radio which I keep on a bedside table. The volume control is hardly ever advanced past the point at which the switch closes and for this reason that portion of the element became so erratic it was not usable.

A replacement control was not immediately available, so other steps were required. My solution to this problem was to insert a fixed resistor of approximately 10% of the potentiometer value in series with the control. The added resistance is not enough to upset the circuit requirements, but it is enough to change the operating point to a virgin portion of the element.

This simple remedy would work as well in a carrier null circuit, a microphone gain control circuit, or anywhere this problem is experienced. Not only is the relatively high cost of the pot saved, but also the inconvenience of obtaining and installing it.

CUSTOM LOG PAGES

It seems as though every time the subject comes up someone in the group will comment about his lack of appreciation of the various commercial efforts at producing a log. Two of the most frequent complaints are the lack of space for comments and the multiple columns provided for data the operator couldn't care less about. Obviously no one log form can please everyone, so why not design a log to your own liking and in line with the type of operating you do. There is nothing sacred about a commercially printed log – all you need to do is provide the data required by the FCC. I suspect the back of an aluminum siding circular would be acceptable as long as you follow the rules and regulations as set forth in 97.103.

Decide for yourself what you want, then have a hundred or so copies mimeographed by your local business service. The last time I had this done it cost 3¢ each. If you have access to duplicating equipment this is just that much more frosting on the cake.

My own preference runs to a rather simple form with separate logs for each

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band. Across the top of each page is the statement that "unless otherwise noted all emissions are A3 , on the 50 MHz band. All entries are in CST." This frees a lot of space for worthwhile commments. The far left column (through which 3-ring-binder holes are punched) is for the date. This is followed by columns for times in and out, other station's call, power level (if you run only one power level state this in the heading and omit the column) and a very large comments section. I personally like about 50 lines per page but you can do it the way *you* like it. Try it once and you will never buy another commercial log-book.

RF TOROIDS 12/$1.00

A homebrewer seeing the above heading in a parts catalog would probably order at least a dozen on general principles. The quality is excellent, the item is useful, and the price is right.

There was a need for a toroidal core for a miniature vfo and not having one available, catalogs were consulted in the hope of finding an inexpensive source of supply. Having seen a reference to using ferrite slugs for this purpose, the search was centered on this item. The chosen supplier (on the basis of price) advertised standard ¾ in. square, double tuned, 10.7 MHz transformers at 3 for a dollar. Each transformer has two slugs of ferrite of a rather odd shape. The exact upper frequency limits of these slugs is unknown. Catalog listings of "red" cores (to which it is assumed these are similar) indicate a range of .5 to 30 MHz. The outside of the slug is threaded and screws down over the outside of the coil, while one end features a recess which allows the center to fit inside the coil.

After the slug is removed from the transformer and clamped gently in a vise it is an easy matter to hacksaw it into two pieces of equal thickness. One of these pieces will be a ready-made toroid measuring 9/16 in. O.D. x about 3/16 in. thick, and ready to wind after a little filing to remove burrs and round edges which might cut through the winding insulation. Three transformers have thus far yielded six ready-to-use cores and six discs of ferrite. These discs are now drilled in the center with a small bit, 1/8 in. is large enough. This serves as a pilot hole for enlarging the center to a usable size. The actual hole may be made in several ways, the most rapid of which is a 5/16 in. round rotary file in a high speed hand grinder. A hand reamer may be used, though it requires more care. File as before, and you have six more cores for your dollar.

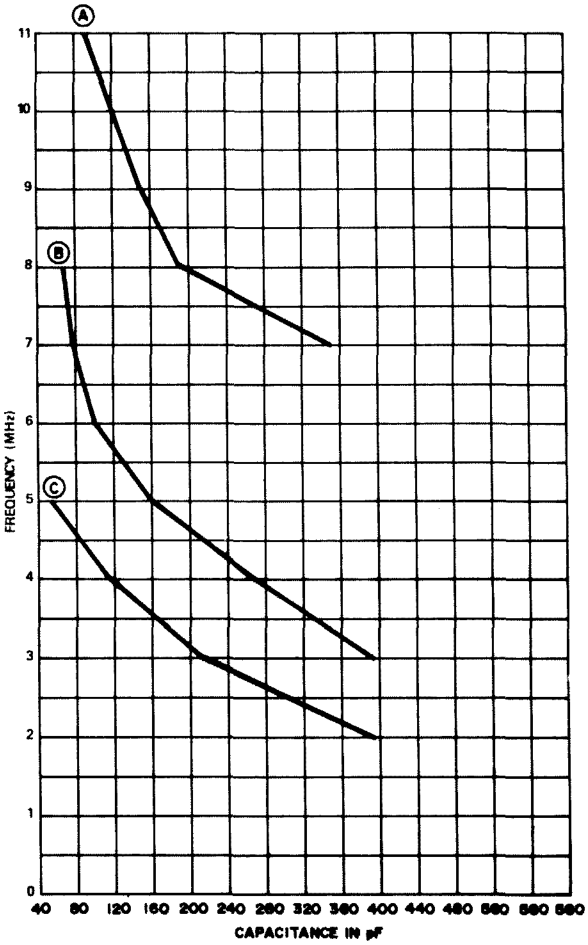


Fig. 1. Graph of capacitance vs. frequency for three different windings. (A) = 30 turns, no. 18, (B) = 36 turns, no. 24, and (C) = 65 turns, no. 28.

While it is best to exercise caution so as not to fracture the ferrite when sawing or drilling, no great harm will be done if one should break. A drop or two of epoxy will repair it without impairing its electrical characteristics.

No research has been done on the subject, but it would seem reasonable that similarly shaped cores from transformers

made for other frequencies would work equally well, assuming the intended operating frequency is not too far removed from that for which the core was originally intended.

Leave several inches of lead at each end of the winding and use these as a link for coupling to a grid dip meter after installation in your equipment. Without this link it is impossible to get a dip due to the magnetic field being contained almost entirely within the core. After dipping to frequency, cut the leads short and install as usual.

QUICK CRYSTAL CHECKER

What does one do with an unmarked or questionable crystal? You could try it in several different types of oscillators to determine if it would oscillate. An all band receiver would tell you the approximate frequency of oscillation if you don't mind tuning carefully and bandswitching a few times.

A simpler way is to make the crystal think it is a filter (which it is) and sweep the spectrum until you find a frequency which the crystal will pass. The usual shop type signal generator and a vtvm or wideband scope are all that are needed. The generator ground is connected to the indicating device ground and the crystal connected in series with the hot leads. Tune the generator rapidly while watching the meter or scope for an increase in amplitude. At the first sign of a flicker, peak the generator and read the frequency. Obviously this is not of frequency meter accuracy but then again a crystal frequency is determined to some extent by the circuit in which it is used and for this reason it is impossible to get an absolute frequency check without using the crystal in the circuit and under the ambient conditions of voltage and temperature. Also obvious is the fact that the measurement can't be more accurate than the generator used.

Fundamental crystals of up to 12 MHz have been checked in this way with complete success. Overtone crystals have been checked too, but due to response limitations of the scope it was possible to check their fundamental frequency only. The scope used is down 3 db at 4.5MHz.

In summation, the above will tell you if a crystal is active and get you in the ballpark frequency wise in a lot less time than any other method. P.S. it works with LC circuits too.

INCREASE YOUR GRID DIPPER RANGE

There is general agreement that a grid dip meter is an invaluable piece of amateur test equipment. Why then cofine its use to the usual frequency range of 2 or 3 MHz to perhaps 250 MHz when it is easy to make additional coils to cover the lower ranges.

Browsing through the catalogs will quickly convince you that hardly anyone sees fit to supply low frequency coils and when they do it is at additional cost. Why not make your own?

All you need is a base that will fit the coil socket of your dipper, a coil form or two, and a little patience. My current dipper is a Heath GD-1 (which I find superior to several others I have had around the shack) which requires a two pin coil base. In my case I had only to bend two lengths of copper tubing to the proper spacing for the coil terminals at one end and the socket spacing at the other. After the proper frequency range was established, the entire coil and about a half inch of the leads were potted in casting plastic, making a very sturdy assembly.

The low cost coils I used (5¢ each) came equipped with a ferrite slug. I left the slug in for the lowest range – 250 kHz to 1 MHz and took it out for the higher range – 1 MHz to 2 MHz. No exact data can be given due to the variation in dipper circuitry. This will be a case of pure "cut and try." The range of the new coils must be plotted on a graph against the original dial markings.

A general coverage receiver will allow calibration down to 550 kHz and by feeding the signal into its i-f strip, an additional point at approximately 450 kHz is obtained. Below that frequency things get a little tougher. If you happen to have a low frequency receiver, fine, if not, use harmonics in the BC band.

. . .WAØABI

Dennis P. Bryan W5QWY/Ø
5612 W. 66 St.
Edina MN 55435

A SIX METER TRANSCEIVER

from a used CB rig

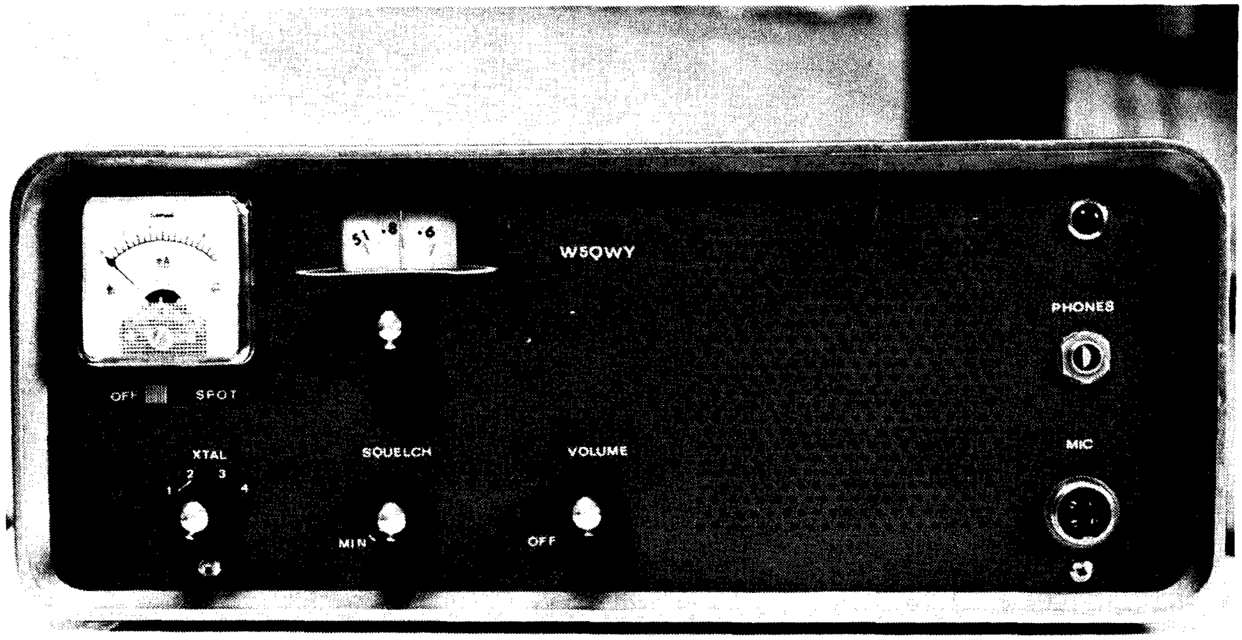
The manufacturers of CB transceivers have been flooding the market for years and as a result have created a mecca of used gear that can be bought for a song. The radio amateur, with a little innovation, imagination and bench work can easily convert these CB transceivers into six meter rigs that will give a good account of themselves by anybody's standards.

Interested? Well, here is one way to do it!

I chose as a guinea pig the Lafayette Comstat 19 – first because it is a simple rig and second it is cheap.

Figure 1A is a block diagram of the Comstat 19 and attests to its simplicity. The receiver section consists of a 6BZ6 rf amplifier, 6GH8 oscillator/mixer, 6BJ6 455 kHz i-f amplifier, 6T8 detector and first audio amplifier and a 6AQ5 as audio output. The 6AQ5 also serves as the modulator when transmitting.

The receiver oscillator frequency is determined either by the main tuning capacitor or by a crystal, whichever mode is selected. The receiver oscillator tunes 455 kHz below the



W5QWY's converted Comstat 19.

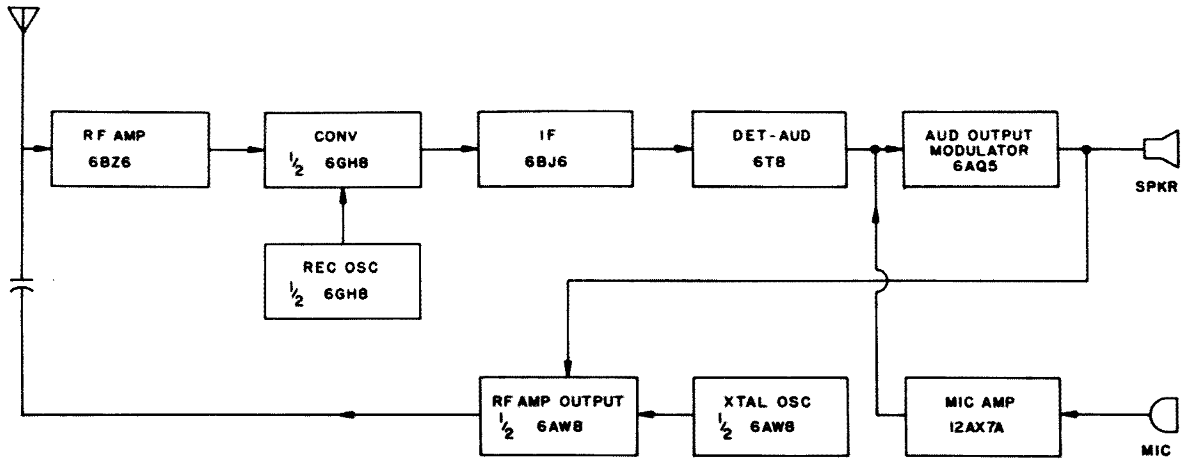


Fig. 1A. Original circuit.

incoming signal to produce the 455 kHz i-f. There is provision to select up to nine receive and transmit crystal frequencies.

The transmitter consists of the triode section of a 6AW8 as an overtone crystal oscillator followed by the pentode section as an rf amplifier. The microphone output is amplified by the 12AX7 and modulates the pentode section of the 6AW8 thru the 6AQ5. Note that no antenna relay is used. The antenna is connected to both the receiver rf amplifier and transmitter rf output at the same time.

As I said before, this is a simple and cheap but salvageable CB transceiver. On more expensive units you can expect to find such improvements as double conversion, multiple i-f stages or a higher (1650 kHz) i-f frequency, more crystal positions and relay send/receive control to name a few.

Generally speaking, the more of these improvements the basic CB transceiver has, the easier the conversion job. For instance if the CB transceiver has either a 1650 kHz i-f or is double conversion then it will only be necessary to add a conversion stage to take the 50 MHz signal down to the 27 MHz CB frequency and to convert the transmitter for 50 MHz output.

Comstat 19 Modification

The big drawback with the Comstat 19 is the single i-f stage operating at 455 kHz which gives poor image rejection even at CB frequencies. The first conversion attempt consisted of merely adding a 6U8 50 MHz rf amplifier and mixer down to 27 MHz. However the image signal was about half as strong as the primary signal. Such performance was totally unacceptable and it was decided to change the i-f frequency to 1650

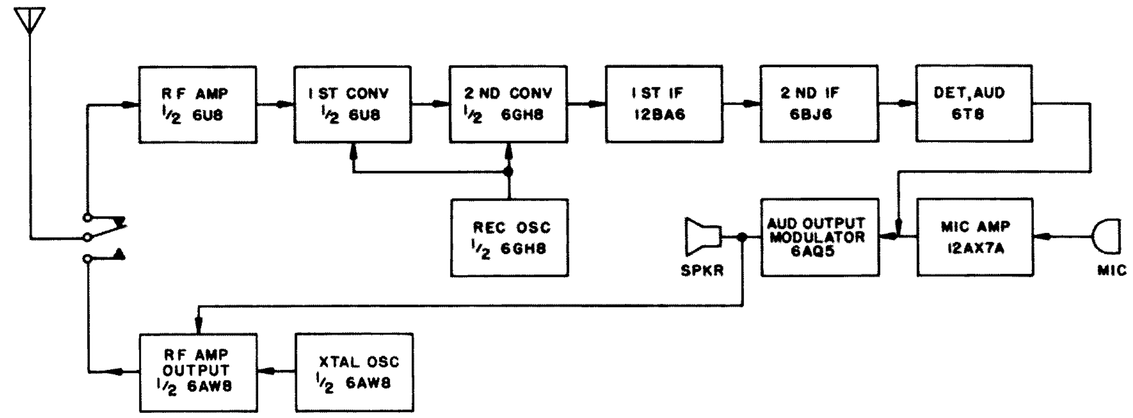
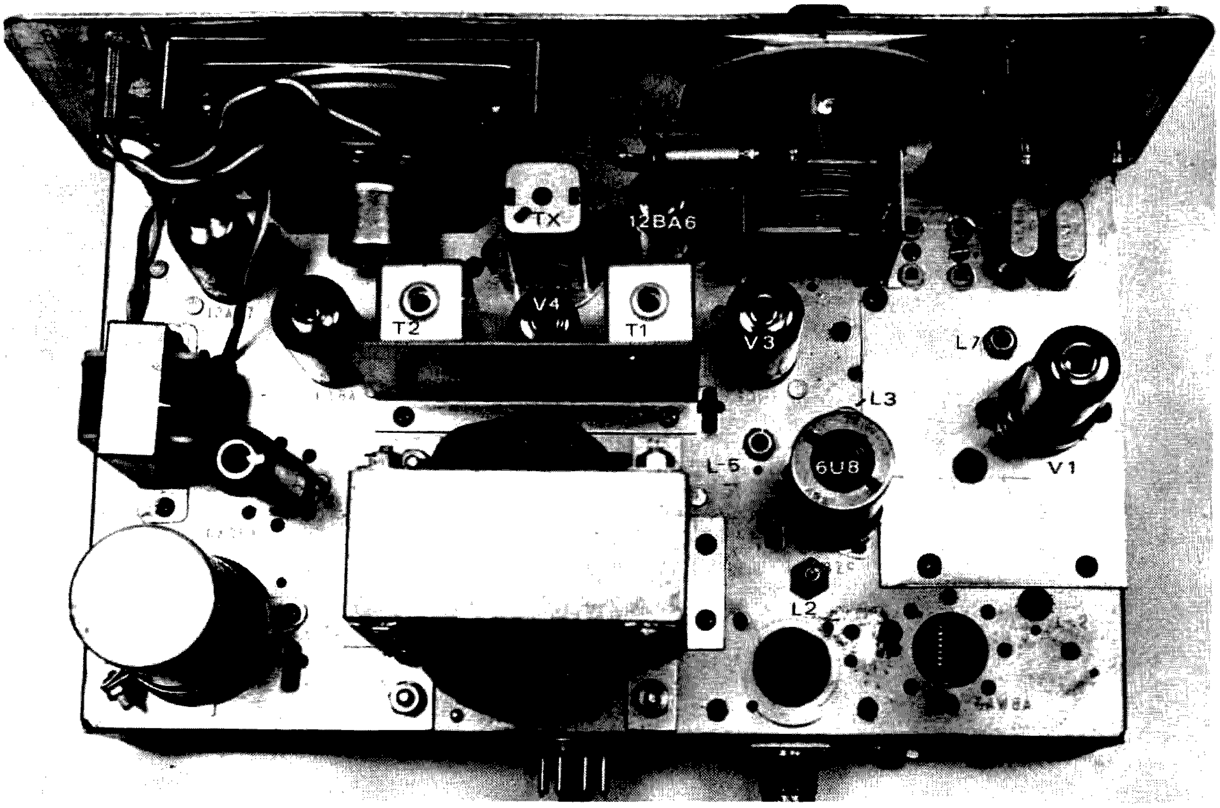


Fig. 1B. Modified circuit.



Top chassis view. Note the locations of the additional i-f stage 12BA6 and transformer TX. The 6AW8 was relocated on an aluminum plate in the upper right corner of the chassis where the original array of receive/transmit crystal sockets and switch used to be.

kHz. This did the trick as the image was now barely perceptible.

Figure 1B is a block diagram of the converted Comstat 19. A 6U8 rf amplifier/mixer replaces the original 6BZ6. The input and output tuned circuits of the 6U8 are stagger tuned to give a flat response between 50.0 and 51.0 MHz. The output of the 6U8 converter is 25.825 MHz for a 50.0 MHz signal and 26.325 MHz for a 51.0 MHz signal. The 6GH8 injection oscillator tunes 24.175 to 24.675 MHz to produce an i-f frequency of 1650 kHz over the range of 50.0 to 51.0 MHz. Using a common injection oscillator for the first and second convertors eliminates the necessity of adding another tube. Note, however, that it only takes a swing of 500 kHz of the oscillator to tune 1 MHz of the six meter band.

Following the 6GH8 second converter are two 1650 kHz i-f amplifier stages. The 12BA6 i-f amplifier was added to make up for the gain lost when converting from the 455 kHz i-f frequency. The rest of the receiver section is left unchanged.

The transmitter lineup is basically the same, that is, an overtone oscillator (now operating at 50 MHz) followed by a rf amplifier. The location of the transmitter section was completely changed to accommodate shorter rf leads, better current paths, and make room for the transmit/receive relay and output tuned circuit.

Destruction

The first step in making the modification is the removal of parts or sections of the transceiver that will be changed. The following list will serve as a guide for component removals. However, it is recommended that the original wiring diagram that came with the transceiver as well as Figs. 2 and 3 be studied thoroughly to make sure you understand exactly what must be removed before beginning.

Save all the components that are removed as many of them will be reused.

Remove . . .

1. Both ends of all components mounted on the 6AW8 socket.
2. The 6AW8 socket.

3. The PI-output coil, capacitors and bracket.
4. The crystal selector switch and crystal socket assembly.
5. The wires to the front panel XTAL/TUNE switch.
6. The front panel crystal sockets.
7. Both ends of all components mounted on the 6BZ6 socket up to the 10 μF capacitor connected to pin 2 of the 6GH8.
8. The 6BZ6 socket.
9. All of the components in the receiver oscillator tuned circuit up to the 20 μF capacitor that goes to pin 9 of the 6GH8. The main tuning control "VCT" should be left mounted.
10. i-f transformers T1 and T2 should be removed and the inside form and windings discarded. The Miller transformers should be inserted into the original cans and these in turn remounted. The Miller transformers are just the right size, can and all, to fit into the original cans. For what it is worth this will provide double shielding on these two transformers.

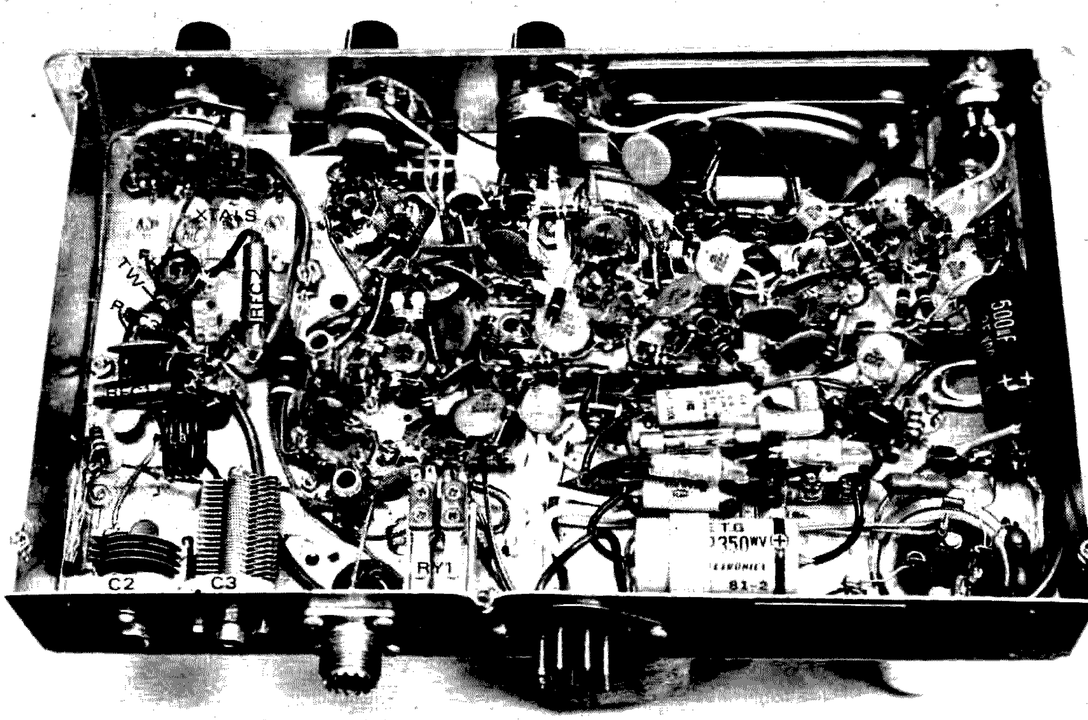
Construction – Receiver Section

Refer to the photographs to help identify the components and locations.

1. Enlarge the old 6BZ6 socket hole to accept a nine pin shield base socket for the 6U8. Orient the socket so that pins two and three are closest to the antenna coax socket. Drill holes to mount L2 and L3. L2 should be mounted close to pin 2 and L3 close to pin 8 of the 6U8.
2. Make sure all underchassis components are moved out of the way before doing these next steps.
3. Drill a hole for a 7 pin socket between T1 and the front panel for the 12BA6 first i-f amplifier.
4. Drill a hole for the additional i-f transformer "TX" between V4 and the front panel. This transformer is easiest mounted by drilling one large hole and using the special mounting plate supplied with the transformer.

Construction – Transmitter Section

1. Cut a piece of .16 cm thick aluminum to cover the rectangular space left from the removal of the crystal socket assembly. Mount the transmitter components on the plate as shown in the top view photograph. Holes are drilled in the plate to mount it to the chassis in the same position that was



Bottom chassis view. Note the locations of C2, C3, RY1 and RFC1, 2 & 3 that are grouped around the 6AW8 socket near the left end of the chassis.

used to mount the original crystal socket assembly.

2. Mount the output indicator meter on the front panel. When making the hole (where the old external receiver-transmitter sockets were mounted) make sure it is high enough to allow the slide switch to be reinstalled below the meter.

Wiring

The heater circuits should be the first circuits rewired. It's a lot easier to do before the bottom of the chassis gets cluttered with circuit components. The heater circuit shown in Fig. 2 should be followed closely since the original wiring did not fully agree with the diagram supplied with the set.

The original winding on L5, L6 and L7 must be removed and rewound per Figs. 2 and 3.

The dc power source parts for the send/receive relay are mounted on spare terminal strip lugs in the power supply section of the transceiver.

The converter oscillator injection signal is coupled to the 6U8 by soldering an insulated piece of hookup wire to pin 9 and twisting the other end several times around pin 2 of the 6GH8.

The 1 MΩ resistor in series with the spot switch limits the oscillator output preventing overloading the receiver while spotting. Diode D1 allows voltage to be applied to the oscillator but not the amplifier while spotting.

The only real important thing to keep in mind while doing the wiring is to keep all rf leads and bypass leads as short as possible.

Note that the secondary of T1 which was originally wired to V4 is rewired to the new first i-f amplifier – the 12BA6.

Operation

Since most of the six meter activity in this area is confined to the first 1 MHz of the band and since only the receiver oscillator is tuned it was decided to limit the tuning range from 50.0 to 51.0 MHz.

T1, TX, and T2 are tuned for maximum response at the i-f frequency. L2, L3 and L5 are tuned for maximum even response between 50.0 and 51.0 MHz. It was found that tuning L2 towards 50.0 MHz and L3 towards 51.0 MHz gave the best uniform-stable operation.

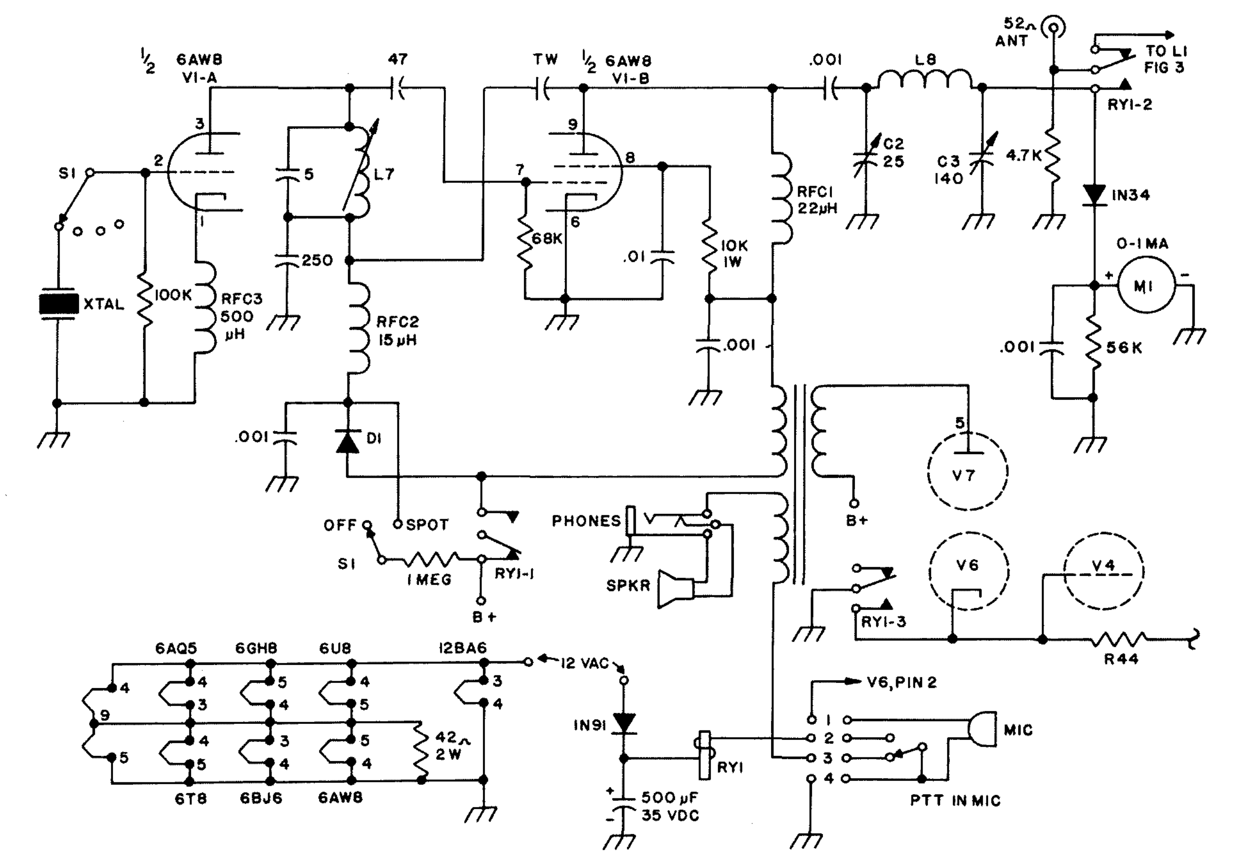


Fig. 2. Transmitter, filament, control.

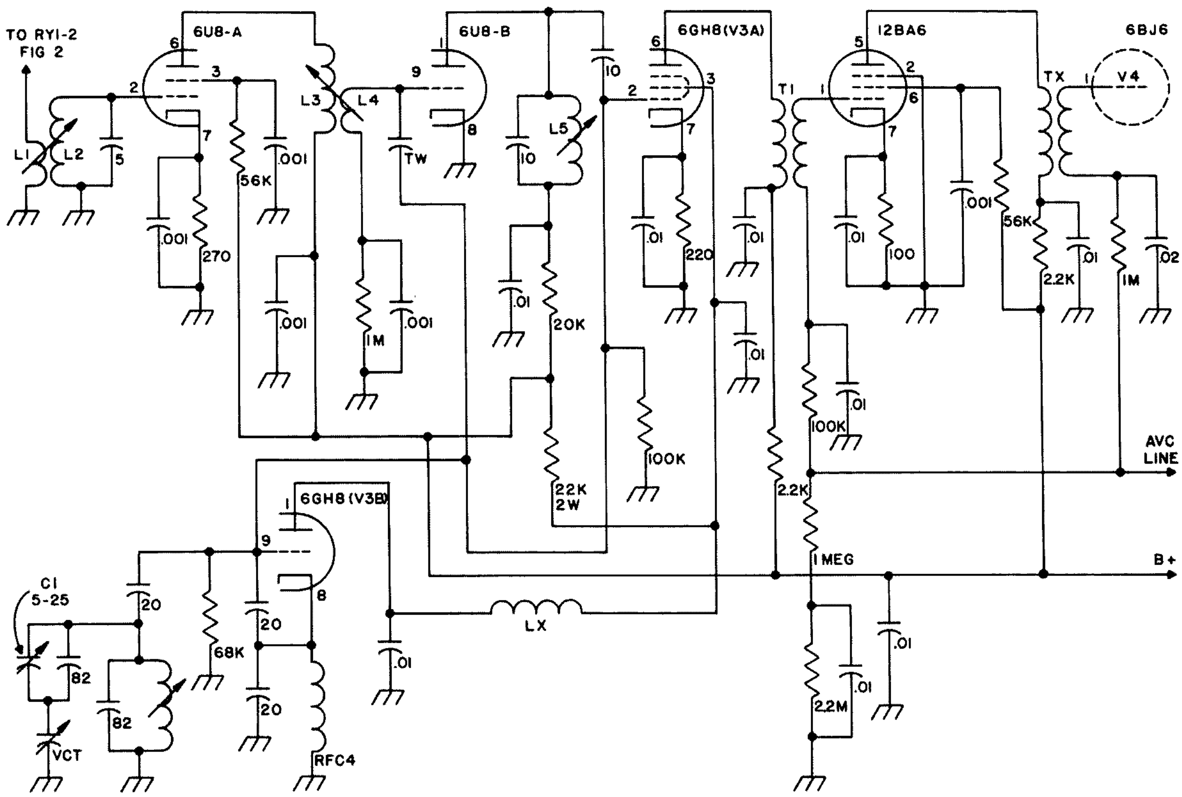


Fig. 3. Receiver. Resistors are in ohms, are ½W, except: K=1000, M=Megohm. Capacitors are in picofarads, decimal values are microfarads unless specified otherwise. Only parts not contained in the original unit are listed. L1 — 3 turns No. 22 insulated hook-up wire over the cold end of L2. L2 — 10 turns No. 32 enameled, close wound, ¼ in. slug tuned form Miller No. 4500. L3 — 12 turns No. 32 enameled, close wound, ¼ in. slug tuned form Miller No. 4500. L4 — 2 turns No. 22 insulated hook-up wire over cold end of L3. L5 — 18 turns No.26 enameled, close wound, ¼ in. slug tuned form (use original form). L6 — 7 turns No. 26 enamel, close wound, ¼ in. slug tuned form (use original form). T1, T2, TX — 1650 kHz i-f transformer, Miller No. 1732. VCT — original main tuning capacitor. C1 — 5 to 25 μμF NPO Ceramic trimmer capacitor. LX — Original receiver oscillator plate coil — left unchanged. TW — Twisted wire coupling capacitors.

The oscillator tuning range is set by adjusting CI and L6. Increasing the value of Cl will increase the tuning range obtainable by "VCT" the main tuning control. Once the tuning range has been set the dial can be marked and calibrated. The old markings can be removed by using a fine grade sandpaper. The new markings, in 200 kHz increments, were added using Datak dry transfer decals.

The transmitter output is peaked by adjusting the slug in L7. The output circuit is a conventional Pi-tank and is tuned for maximum output indication on M1. If M1 needle pins a suitable dropping resistor can be inserted between M1 and the 56K resistor.

The neutralizing capacitor "TW" consists of two pieces of insulated hook-up wire. The end of one wire connects to pin 9 of the 6AW8. The end of the other wire connects to the junction of RFC2 and L7. The free ends of these two wires are twisted together enough to obtain stable amplifier operation. Any excess wire must be trimmed off after neutralization is completed. A final test for stability can be made by removing the crystal from the socket and running the amplifier 25 pF capacitor thru its range. If the amplifier goes into oscillation then it is not properly neutralized.

As a final touch, since the transceiver had seen rough CB handling, the front panel was repainted and lettered using Datak lettersets making control label changes as appropriate.

Although this conversion was made to a Comstat 19 the general principles can be used on other CB transceivers. With a minimum of cash outlay, depending on the size of your junk box, you can end up with a pretty good signal on six meters.

. . .W5QWY

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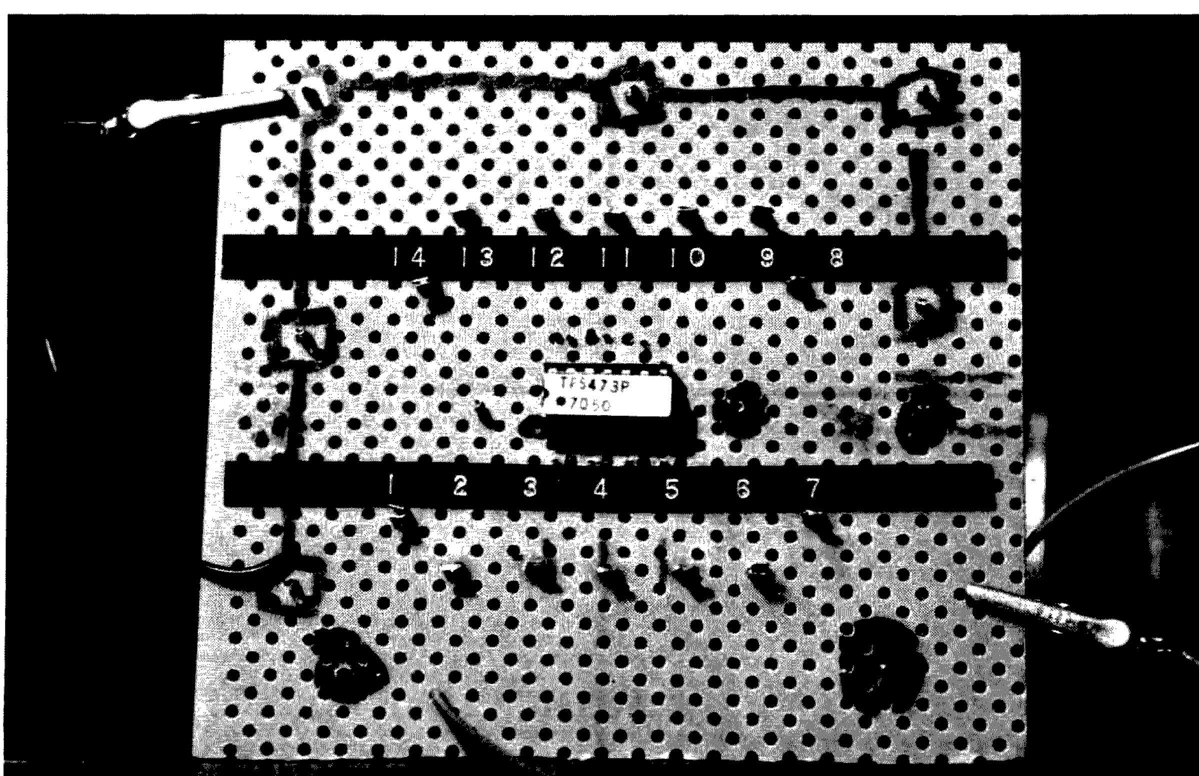
MACRO-IC-OLOGY

There comes a time in everyone's life when the feeling steals in that something is missing. After graduating from tubes to solid state, the something missing in my life turned out to be a test jig or fixture that DIP IC's could be plugged into for testing. Since half the fun of a test jig for microcircuits demands large size spread out for ease of use, I applied the science of *Macro IC ology* which is the art of making the small into the large.

The basic foundation is a 10.16 x 10.16 cm piece of .16 cm XXXP Bakelite punched with a .254 x .508 cm alternate grid. This is much cheaper than using the punched epoxy glass board whose chief virtue is its .254 x .254 cm hole pattern which is ideal for DIP purposes. Highly advanced amateur technology known as "making do" does call for possession of a small piece of this epoxy .254 x .254 cm board, which is used as a drilling template for the XXXP board. You simply align the two pieces of perforated board in the vicinity of where you wish to drill a standard DIP pattern. A little observation shows that the boards will line up with every other hole, piece to piece. You simply clamp the aligned boards in a vice and run a No. 60 drill through the "every other hole" that needs drilling in the XXXP board to establish your pattern. The two parallel rows of holes have a 1.02 cm separation between



A dual flip-flop is shown plugged into the test socket. The dark line running around the left side and top of the board shows the path of the ground bus. The irregular dark areas around other pins mark the positive bus path. Photo credit to Ira Joffe WA3PTC.

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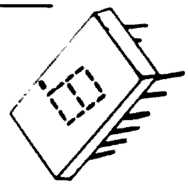

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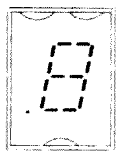

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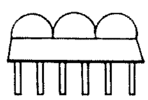

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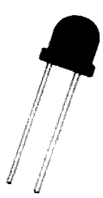

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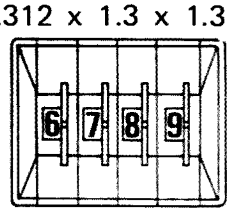

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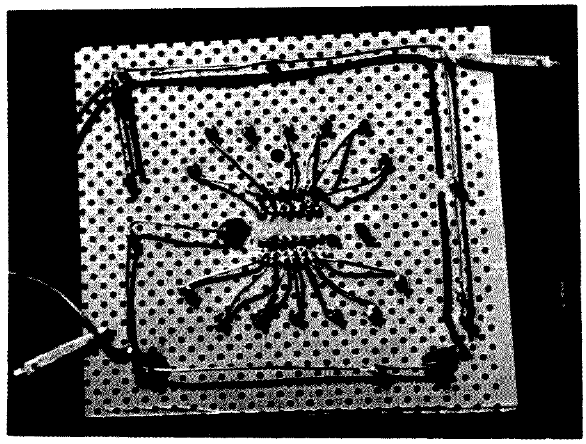

Arching of leads to IC shown to indicate facility for tack soldering to them. The leads leaving the right hand side of the board are for bringing an external power supply to the unit. The negative bus is traced out by the dark line adjacent to the wire. The positive bus is marked by the roughly circular areas around some of the terminals. Photo credit to Ira Joffe WA3PTC.

them, which quite naturally is the spacing of four holes in the template .254 x .254 cm epoxy board.

A 14 pin circuit stik DIP element was used to mount a matching IC socket in the center of the board. Push-in terminals were inserted into the 0.062 holes first to establish a wide open terminal arrangement for the socket pins which also allowed for clear numbering of the pins with a dymo label strip. Next, a row of terminals was marched around the board for a ground bus and a matching row for a positive bus. A long lead was attached to each bus to bring power to the board. A short red wire terminating in an alligator clip was tied into the plus bus and a similar black lead was wired to the ground bus. Since various IC's demand power to different pins this made it easy to supply such differing connections easily.

The connections from the IC pads to the push-in terminals was made with the heaviest solid wire that would go through the pad holes. These wires were deliberately arched above the board to facilitate their use for tack soldered cross connections as various test setups might call for. Naturally the push-in terminals also afford such tack solder locations. Try one of these and you too can strike a blow for *Macro IC ology*, while adding a very useful test fixture to your armament.

. . .W3KBM

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HOW THE COMMUNICATIONS RECEIVER BEGAN

The communications receiver appeared almost overnight it seemed, in late 1934. One month it didn't exist – and the next, there they were – the National HRO, Hallicrafters Super Skyrider, RME 9-D, RCA ACR-136 and the Patterson PR-12. Of course there were receivers for communications before this, but they were either the monstrous instruments of communications companies which occupied several relay racks or the inefficient regenerative receivers and superhets of amateurs. The small, self-contained, high-performance and versatile package we think of as a communications receiver simply did not exist.

Their sudden emergence in 1934 was only a surface appearance. It really began back in 1932. In June of that year, James Lamb, technical editor of *QST*, wrote an article entitled, "What's Wrong With Our CW Receivers?", in which he argued that the broad tuning and unstable receivers used by amateurs were not technically abreast of the contemporary crystal-controlled and well-filtered transmitters.

A second article (in the August *QST*), "Short-Wave Receiver Selectivity To Match Present Conditions" was subtitled, "Constructional and Operating Features of the Single-Signal Superhet." It described the use of the crystal filter for single-signal CW reception and, because increased selectivity demanded better frequency stability, showed how to stabilize the high frequency oscillator. In order to overcome the common objection that superhets were insensitive and noisy, he also discussed the principles of quiet and electrically stable rf amplifiers.

Here was a receiver with the high performance of a communications receiver, and versions of it were built by many advanced amateurs. By 1933 the crystal filter was offered as an option by several companies. Before the manufacturers could produce a true communications receiver on the production lines however, many practical problems had to be overcome. They had to gang and track three or four tuned circuits for single control tuning. An order of frequency stability never before achieved on a production line basis was forced by the adoption of the crystal filter. Better tuning mechanisms were required. Plugging in three or four separate coils would be anachronistic with such advanced receivers, so efficient methods of band changing were developed. Direct calibration required more uniform tuning capacitors in order to use mass-produced dials.

At the same time the public's interest in shortwave broadcast reception was ap-

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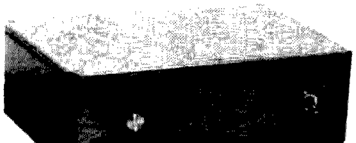

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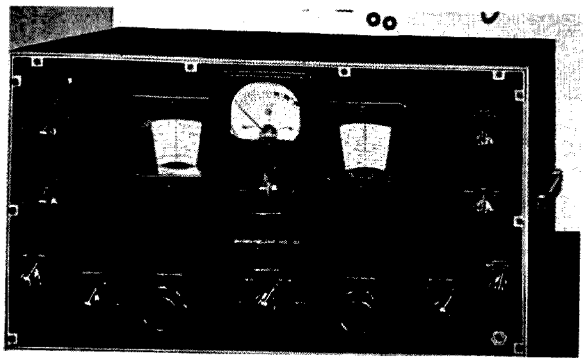
proaching the proportions of a craze. Almost all broadcast receivers covered a portion of the shortwave bands. Indeed, the all wave broadcast receivers were ahead of communications receivers in many areas. Bandswitching, direct calibration, avc and rf amplification were all in common use before their adoption by communications receivers. Several broadcast receivers used double conversion in the early 1930's, fifteen years before it was first used in communications receivers.

The receivers of the point-to-point communications companies in early 1934 were advanced in performance and often custom built, with special components. The big labs like RCA and Bell produced these, and they could afford to use components and techniques too expensive for amateur and broadcast receivers. These receivers often used diversity receiving techniques, and they would soon install single sideband systems for their trans-oceanic routes.

As 1934 opened the average amateur still used the regenerative receiver with one or two stages of audio and perhaps a stage of tuned rf amplification. This was the same basic receiver he had been using for fifteen years. Some phone operators used the superhet, but it was generally conceded to be less sensitive than the regenerative set. Being quite simple, the regenerative receiver was often home-built, but several commercial models such as the National SW-3 and SW-5 and the Pilot Super Wasp were popular.

An occasional commercial superhet was found in the shacks of hams. Perhaps the most advanced of these receivers was the National AGC which included an rf amplifier among its nine tubes. It had single control tuning, avc and offered an optional crystal filter. The AGC was a well-built and engineered instrument for "... the fortunate amateur who can select his station equipment without regard to cost, as well as the commercial operator to whom nothing less than the best is adequate ..." Three separate coils had to be plugged into the front panel to change bands. Frequency was determined by charts on the front panel and there was a separate power supply.

The Hammarlund Comet Pro was another superhet used by some of the more affluent



The Hammarlund HQ-120, original receiver in the famous HQ- series which was manufactured for over thirty years.

hams. This eight tube set had no rf amplifier and required plugging in two coils in shield cans on the chassis in order to change bands; avc and a crystal filter were optional extras.

Thus there were three classes of high frequency receivers in early 1934. The all-wave broadcast sets had most of the conveniences of modern communications receivers – self-contained, small, bandswitching, avc, calibrated tuning dial – but they were deficient in performance. The communication company receivers utilized modern techniques such as diversity reception, single sideband, stabilized oscillators and crystal lattice filters but were very bulky and prohibitively expensive. The amateur receiver was still in the dark ages of receiver development, having neither the convenience of the all-wave broadcast set nor the performance of the commercial receivers.

Then in October, 1934, Hallicrafters announced the first of a long line of Super Skyrider receivers, a completely self-contained seven tube superhet. National announced their HRO for October delivery, and it was finally ready in December. By the end of the year the RCA ACR-136, RME 9-D, Patterson PR-12 and several others were on the market.

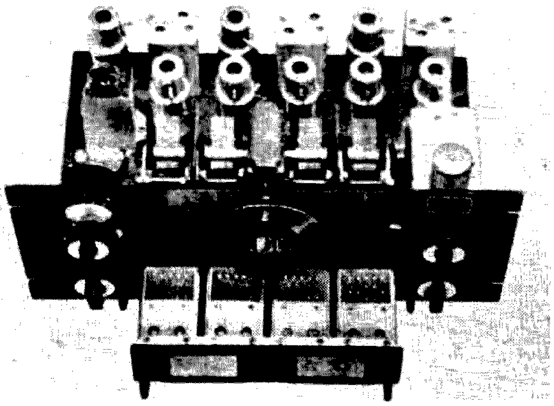
New developments came rapidly in 1935. Spurred on by the growing high frequency receiver market the components manufacturers developed improved insulation for bandswitches and coils, new metal tubes (6K7), acorn tubes to reduce input loadig and make amplification possible at higher frequencies, and iron core i-f transformers. The communications receiver manufacturers immediately introduced new sets incorporating improved techniques and components.

Hallicrafters, Silver (5-C), RCA (AR-60), Patterson (PR-16), Breting (12) and Sargent (20) all came out with new receivers during 1935. Tobe-Deutschman marketed both a general coverage and an amateur-bands-only receiver kit designed around the "Tobe Tuner," a pre-wired front-end.

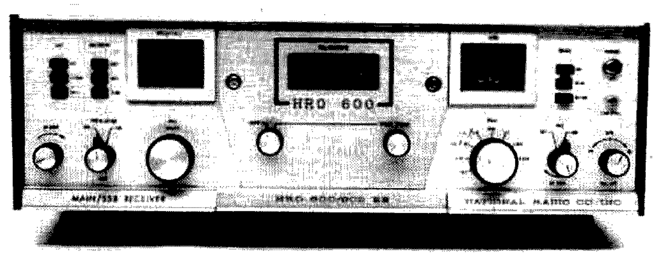
During 1935 Hallicrafters twice revamped their line, so fast were developments made. In January they announced three new models of the Super Skyrider, the S4, S5 and S6, differing in the frequency ranges covered. There was an optional crystal filter which added an "X" to the model designation, i.e., SX-4. In September they again revised the Super Skyrider. The new SX-9 had nine tubes and was the first communications receiver to use metal tubes and iron core i-f transformers. This was the last of the Super Skyriders with a built-in speaker. From 1936 Hallicrafters offered a complete line of receivers starting with the $29.50 Sky Buddy. By the end of the decade the model numbers had reached the SX-24. Other models which carried the Super Skyrider name were the SX-11, SX-16, SX-17 and SX-28.

Hallicrafters specialized in giving the most possible features for the dollar and in bringing new developments to the market in the fastest possible time. They did this by using almost all purchased components, capitalizing wherever possible on the low-priced, high-volume parts developed for all wave broadcast receivers.

National approached the manufacture of communications receivers differently. They designed and manufactured most of their own components including tuning capacitors, i-f transformers, coils and tuning mechanisms. When, in 1937, they brought out the medium-priced NC-80 series they were quite apologetic in their advertising. The accepted approach is to say that through superior engineering and a reckless disregard for profits a superior receiver is offered at a low price. National said, "Most amateurs do not need to be told that when a



Early photograph of a rack mounted version of the classic National HRO.



National HRO-600, a modern professional class receiver. A receiver with remotely similar performance would have occupied two six-foot relay racks in the 1930's.

communication receiver is to be sold for as low a price as the NC-80X it is necessary to make compromises."

It is also interesting that National did not employ the conventional coil switching method of band changing in any but their cheapest receivers until 1947. The HRO used plug-in coils until 1959. Other receivers in their line from 1937 used the movable coil system. Up to 24 coils were mounted in individual compartments in a die-cast aluminum pan installed on the bottom of the receiver. Sets of coils were moved into position and plugged in by moving the entire pan on rails through a geared arrangement from the band-change knob on the front panel.

The National HRO, the most famous and long-lived of the receivers which were introduced in late 1934, seemed doomed as an anachronism before it ever appeared. Yet it remained in production, basically unchanged, until 1949. It underwent modifications through the late 1950's, retaining to the last the famous PW dial and the plug-in coils. The receiver did not have direct calibration and had a separate power supply. It was a triumph for uncompromising design, disregarding as it did fashion, fad and expediency. A comparison of the performance of the original HRO with more modern receivers is given in the Table.

In 1933 Hammarlund started design of the ultimate receiver, the Super Pro, which was scheduled for release in early 1935. Their approach, like National's, was uncompromising. They designed a unique bandswitching mechanism, i-f transformers with variable coupling and a special twelve gang

Performance of the original HRO compared with some modern receivers.

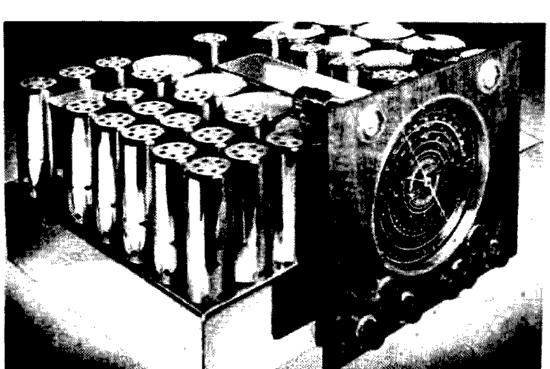
	National HRO (1935)	Hammarlund SP600 (1950)	National HRO-600 (1971)	Drake SPR-4 (1971)
Frequency Stability @ 14 MHz (max. drift)	28 kHz	1.4 kHz	30 Hz	100 Hz
Noise Figure	15 dB	10 dB	12 dB	11 dB
Frequency Readout Accuracy @ 14 MHz (max. error)	42 kHz	28 kHz	0.1 kHz	1.0 kHz
CW Selectivity Bandwidth and Shape Factor	200 Hz @ −6 dB 6–60 dB SF 30:1	200 Hz @ −6 dB 6–60 dB SF 30:1	400 Hz @ −6 dB 6–60 dB SF 6:1	400 Hz @ −6 dB 6–60 dB SF 7:1
Phone Selectivity Bandwidth and Shape Factor	3 kHz @ −6 dB 6–60 dB SF 8.5:1	3 kHz @ −6 dB 6–60 dB SF 6:1	2.4 kHz @ −6 dB 6–60 dB SF 2:1	2.4 kHz @ −6 dB 6–60 dB SF 3:1
Input Impedance	500Ω	100Ω	50Ω	50Ω
Image Ratio @ 30 MHz (min.)	25 dB	80 dB	90 dB	50 dB

tuning capacitor for the receiver. The project was so ambitious, however, that it was mid-1936 before the bugs had been eliminated and receivers were ready for delivery. But it was worth the effort, because the Super Pro turned out to be the most long-lived of all receiver designs. Minor revisions were made in the design in 1939 (SP-200) and in 1945 (SP-400) and in 1949 the SP-600 with double conversion and turret type coil changing was introduced. The SP-600 was sold as late as 1970.

Hammarlund brought out the HQ-120, a medium priced complement to the Super Pro, in 1939. This receiver was aimed at the amateur market to compete with receivers in the Super Skyrider price class. It became extremely popular and after the war evolved into the HQ-129, HQ-140, HQ-150 and finally the HQ-180 which was produced until 1970.

Meanwhile, the all wave broadcast receiver was reaching the height of its development in the creations of E.H. Scott and McCurdo Silver. Both companies specialized in custom receivers sold by mail and promoted through advertisements in magazines like *Radio News*. The sets were versatile in order to appeal to both the high fidelity music lover and the DX fan. They reached a peak in performance and ostentation with the new models late in 1937.

"The Amazing New Scott Philharmonic, World's Most Powerful Radio," headlined a full page ad in the September, 1937, *Radio*



Scott Philharmonic XXX, circa 1937. The receiver had a total of 30 tubes including four 6L6 audio output tubes on a separate chassis. It tuned 150 kHz to 80 MHz in six bands and its bandwidth was continuously variable from 2 to 16 kHz.

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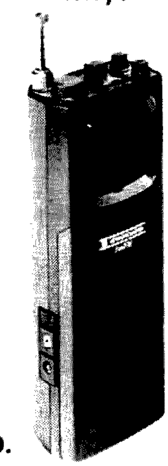

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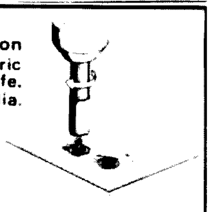

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News. The receiver contained thirty tubes on two chassis, had a 40 watt Class A audio amplifier, covered .15 to 80 MHz in six bands, had two separate amplified agc systems, one controlling the two rf amplifiers and the other the four i-f stages, and it had continuously variable selectivity from 2 to 16 kHz. This was perhaps the finest all wave broadcast receiver ever manufactured.

Silver's claims were no more modest and his receiver no less gaudy. "New McCurdo Silver Masterpiece VI, the Finest Receiver Ever Built," asserted his full page ad in the same issue of *Radio News*. While Silver's tube count was only 21, it generally matched the Scott feature for feature. It tuned .14 to 70 MHz in five ranges. It had two rf and three i-f amplifiers and dual amplified agc. There were four i-f bandwidths of 4, 8, 12 and 32 kHz and the 4 kHz bandwidth had a 6–60 dB shape factor of 2.25:1 and a 6–80 dB shape factor of 3.75:1!

World War II ended an era in the development of the communications receiver. Over 130 different models had been marketed by twenty-odd manufacturers. Of these only Hallicrafters, Hammarlund, National and RME resumed receiver production after the war. Gone were Howard, Breting, Patterson, RCA, Sargent, Meissner and Guthman. Gone also was much of the glamor and excitement because you rarely heard anymore about the people and ideas behind a new model. Big business methods prevailed and the new receivers were the product of anonymous engineering teams in obscure laboratories.

Looking back on the pre-war days from a distance of 35 years, the receivers now seem unimaginative after the original 1934–35 models. Everyone made the same receiver dressed a little differently. The standard communications receiver had one or two rf amplifiers, a mixer, a high frequency oscillator, a crystal filter, two or three 455 kHz i-f amplifiers, a second detector, bfo, and a couple of stages of audio. The techniques for SBB, dual conversion, lattice filters and most of today's refinements were available, but it wasn't until Collins introduced the 75A in 1947 that any manufacturer departed from Lamb's basic 1932 receiver design.

. . .Moore

Laura Sargent XYL WA7UJH
16628 N. 18th Street
Phoenix AZ 85022

THE TRULY GREAT HAM

Most women have husbands with spare-time hobbies. I have a ham who's a spare-time husband.

Not that I'm complaining. I realize that the wife of a great man in any field has to make allowances for his genius – and my husband, if not a "great" ham, is definitely on his way to becoming one.

What does it take to be a Truly Great Ham? Well, it involves more than the ability to operate and maintain radio equipment. What it really means is being able to build an entire life around ham radio. The Truly Great Ham doesn't recognize the importance of any activity unless it can be related to radio in some way. I'm not sure that my ham would even bother to eat or sleep if he didn't need to keep up his strength for his daily radio operations.

What every ham likes best, next to using his radio, is talking about it. Of course he uses every opportunity to bring up the subject. But what can he do if some unenlightened person starts up a conversation that includes no mention of radio? The Truly Great Ham surely can't be expected to waste that golden tongue of his on commonplace subjects like the cost of living, how his wife spent her day, what to do about the leaking washing machine, etc. No, ham energies are best spent on more significant topics. So one of the skills very important to the Truly Great Ham is switching the conversation around to ham radio.

Sometimes my ham cheats. He has been known to sneak into the radio room and turn up the volume just before company is due. Then when everyone is seated comfortably in the living room and making small talk, he jumps up and disappears into the back of the house where all that squawking is coming from, saying, "Whoops – forgot to turn off the ham gear." Well, this is an opening guaranteed to lead into an evening of radio talk, especially since most guests are polite enough (or naive enough) to give him a further opening like, "Oh, are you a ham?" or, worse yet, "Oh, how interesting. I've always wondered how that stuff works."

This approach is usually good only for the first time people visit our home. After a few evenings of "Whoops – forgot to turn off the ham gear," even the politest and most tolerant guests would begin to wonder if a certain ham should be running around loose.

Any ham can do well with an opening like, "Oh, are you a ham?" or, "What sort of equipment is that?" or even "Is that a CB set? My brother used to have one." But the Truly Great Ham can get into his favorite subject with very little help. He has a well-tuned ear – he can hear a radio-related

word whispered at 500 feet. It doesn't even matter if the context is completely wrong. One little word or phrase is enough to start some radio talk not necessarily related at all to what the original speaker had in mind.

Key words like communication, cable, switch, frequency, ham (for dinner or referring to a bad actor), tower (Eiffel or otherwise) will perk up a ham's ears, set his brain in gear and his mouth in motion.

My ham can pick up on the most innocent-sounding words. Sometimes he has to reach a little, of course. Mention chili for dinner and he remembers the time good ol' Morton's wife gave him some of her favorite chili. Good ol' Morton, of course, is better known as W7WRD and they were doing some repair work on his ham station that day.

Some people not interested in ham radio (not *necessarily* sickies) try to avoid radio talk by sticking to "safe" subjects. Where the Truly Great Ham is concerned, however, there is no safe topic. Not even the weather – the all-time great of safe, dull subjects – is safe from a ham's conversation switching. Mention that there's a breeze and the ham will be running out the back door, yelling something about making sure the antennas are guyed down tight. Should anyone notice the slightest rumble of thunder in the distance (and comment on it), he'll dash into the radio shack – if he's not there already – explaining he has to disconnect the equipment so lightning won't strike and blow up everything. This is often followed by that old favorite (and oft-heard) account of Old Ham Buddy Ferd who blew in the whole side of his house back in '56 because he forgot to disconnect . . . or the one about Old Ham Buddy Fard who unplugged his antenna seconds before lightning struck his roof. The Truly Great Ham, of course, has a mountainous stock of Old Ham Buddy stories to fit any occasion.

It's almost impossible to talk to my ham while we're driving anywhere. There's such a wealth of material along the road that he doesn't bother to switch the conversation anymore, but resorts to plain old interruption so he can comment on everything before it disappears in the distance behind us. A typical conversation goes like this:

Me: Did you know that . . .

Ham: Look at that tower (or telephone pole or 80 foot gas station sign or fire lookout, etc.). Would I love to put that up in the back yard!!

Me: Guess what . . .

Ham: Hey, there's K7JRK's antenna. See it through the trees?

Me: I forgot to tell you about . . .

Ham: Wow! *There's* an antenna setup! What I couldn't do with that! Must have cost him a fortune.

Me: Today I . . .

Ham: There's where we have our Wednesday night meetings.

Me: I think we should . . .

Ham: See that pizza place? That's where we all meet after Tuesday night meetings.

Me: Do you think that . . .

Ham: That's where K7YUK found the hidden transmitter . . . That's where K7ONO lives . . . etc . . . etc . . . etc . . .

My ham (and any Truly Great Ham) thinks any activity must be considered incomplete without a radio nearby. This includes, sad to say, intermission at a drive-in movie. Yes, unfortunately, even romance takes a back seat to ham radio. I discovered that the night I pointed out a beautiful full moon and was rewarded with a lecture on the possibilities of bouncing radio signals off it.

Experienced as I am with ham conversational techniques, I can still be surprised by a particularly brilliant move. There have been times when I really believed (silly me!) that my ham was about to carry on a conversation unrelated to radios. The other day, for instance, we were driving around and spotted the most beautiful house on a wooded hill. It had everything – solitude, trees, three fireplaces, swimming pool – everything we'd want if we had unlimited funds to spend on our dream house. "Look at that," I said. "That's the greatest thing I've ever seen. Wouldn't you love to live there?" "Yes," he said. "It's beautiful. It's just the kind of place I'd like to have someday." We stared longingly together as he continued, "The top of that hill is the perfect spot for an antenna. I could hit anyplace in the state from there."

Laura Sargent

Denny Pascoe W8JIX
P.O. Box 14
St. Clairsville OH 43950

INITIAL GENERATOR

. . .for the ham who has everything

In looking for a unique gift for a friend of mine, I decided to design and build a Morse code device for him that would generate his initials. I ruled out the use of a small tape recorder and used monostable multivibrators (one-shots).

Figure 1 shows the block diagram of this device. The Morse code generator (MCG) feeds one of the two inputs of a logic AND gate. The other input to the AND gate is a 600 Hz square wave generator (astable MV). With the MCG at a logic "1" level (+V), the AND gate enables the 600 Hz signal to be fed to the audio amplifier. With the proper sequence of pulses of different duration generated from the MCG, the output of the audio amplifier will be a series of dots and dashes.

Figure 2 shows the logic block diagram of the MCG. The MCG is unique in that it uses one-shots constructed from RTL NOR gates used as inverters. NOR gate 1 starts the sequence. With the logic "0" (zero volts) at E_{in}, the output of NOR gate 1 is at the "1" level (+V), and C_2 charges to $V_{CC} - V_{BE}$. With a logic "1" (+3.6V) at E_{in}, C_2 (left plate) is placed at ground potential because the output of NOR gate 1 is at "0" level. This action causes C_2 to cut off NOR gate 2 for a period of time approximately equal to $.7R_2C_2$.

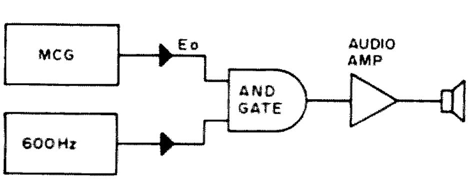


Fig. 1. Block diagram of the Morse code generator.

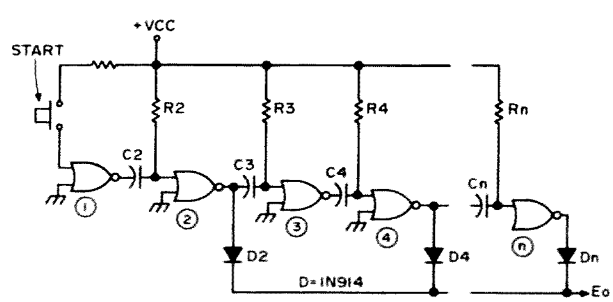


Fig. 2. Logic block diagram.

When NOR gate 2 is cut off ("1" level), a positive potential appears at the anode of diode D_2. This positive potential forward biases D_2 and represents a logic "1" at the input of the AND gate (Fig. 1). Thus a 600 Hz signal is fed to the audio amplifier for a period of time ($.7R_2C_2$).

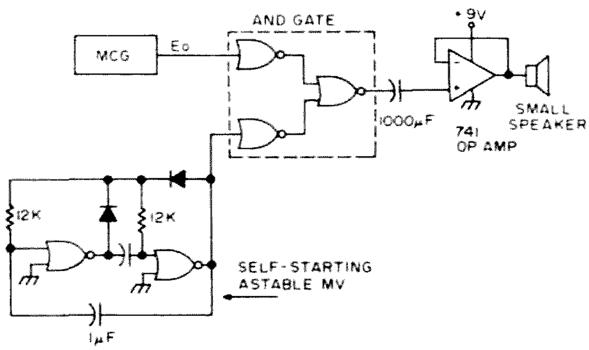
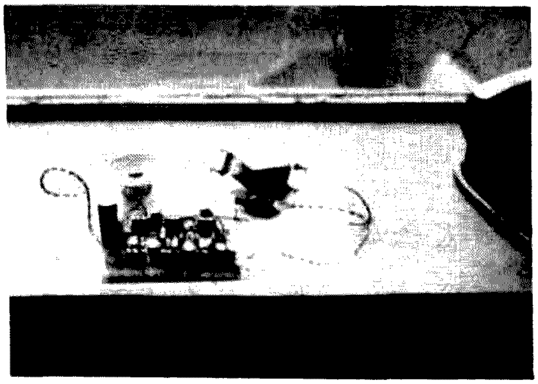


Fig. 3. The 600 Hz astable MV.

While NOR gate 2 is at the logic "1" level, C_3 is charging up to approximately $V_{CC} - V_{BE}$. When NOR gate 2 goes from the "1" level to the "0" level, C_3 causes NOR gate 3 to go from the "0" level to the "1" level. This process of generating pulses continues for each of the NOR gates connected as one-shots. Thus when NOR gate 2 produces a pulse of fixed duration, NOR gate 3 produces a pulse of fixed duration *after* NOR gate 2 produces its pulse. After NOR gate 3 produces a pulse of fixed duration, NOR gate 4 produces a pulse. This generation of pulses continues until all the one-shots generate a pulse.

These one-shots are connected to the AND gate through a diode OR gate. The timing of each one-shot is determined by R and C.

The individual one-shots are labeled dot, dash, letter space, and space between the dot and dash. The dot and dash one-shots are the only one-shots that are ORed together to turn on the AND gate and to allow the 600 Hz signal to be fed to the amplifier. The number of one-shots is determined by the letters to be generated.



Device built by W8JIX.

In the design, R is selected to ensure saturation of the NOR gates used as inverters. I used Motorola MC717P quad two-input NOR gates, although a HEP 573 could be used. C was selected to be 15 μF (measured to be 40–60 μF) at 6V dc. R was calculated to be

dot (•) R = 12K
dash (-) R = 27K
letter space R = 47K

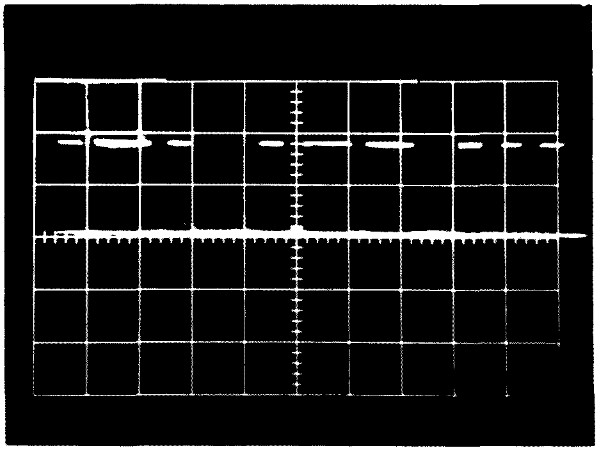


Fig. 4. Output of AND gate.

The 600 Hz astable MV is self-starting so that its output is present at all times. This astable is shown in Fig. 3. Figure 4 shows the output of the AND gate generating the letters "RWS." Any amplifier could be used to feed a loudspeaker. In the original Morse code device, I used a 741 operational amplifier feeding a speaker. This op amp does not produce a loud sound, but it is audible and suitable for the device (see Fig. 3).

I breadboarded the device using a vector board and two 1.5V batteries connected in series for the supply voltage. With the device idling, current drain is 50 mA. A NO push button switch is used to start the sequence of pulses (see Fig. 2). When power is initially applied, a series of pulses will be heard. Once these pulses are generated, momentarily pressing the start-button will generate the letters the device is designed to produce.

The device is an application of a Morse code generator found in a text entitled *Solid-State Switching: Discrete and Integrated*, by Robert D. Pascoe, John Wiley & Sons.

. . .W8JIX

Paul W. McCreery WA9IHV

REGULATED OSCILLATOR SCREEN FOR THE ART-13

As a group, amateurs that still operate ART-13's are not much different from anyone else. The one exception seems to be in their loyalty to the old "Airplane anchor."

Since I joined the ART-13 fraternity only two years ago, I am not as sensitive as some of the members of long standing. Nevertheless, I was incensed recently when I heard a well-known ART-13 XYL accused of frequency drift. When the same thing happened to me a few days later, I realized that something had to be done.

The Collins ART-13 oscillator, as many of you will already know, is built like a frequency standard. In fact my brother-in-law, who engineers for the Collins company intimates that their equipment doesn't drift. This piece doesn't, after a brief warm up, as long as the B+ voltage remains constant. In my case, a simple thing like turning on a 6KW clothes drier caused the oscillator to drift about 800 cycles.

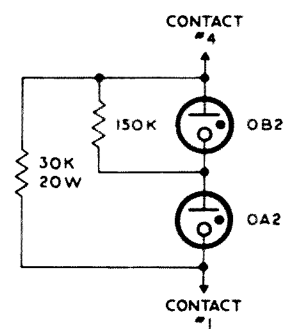
Determining the cause of the drift was easy but the solution was not obvious. Regulate the voltage of course – but how? The 837 oscillator tube has 450V on the plate. In addition to this, the circuit feeds several tubes making the current high. It would take a whole hatful of regulator tubes to regulate this mess.

Finally, I hit upon a plan. Since the ART-13 oscillator we are dealing with is electron coupled, the plate voltage has little effect on the plate current or frequency. Affirming this, I decided to regulate the screen voltage only. It is this voltage that controls the feedback, therefore if the plate voltage changes slightly the tube can't tell the difference.

The modification to regulated screen voltage is rather simple. First a small ell-shaped chassis is built to hold two regulator tubes and after it is wired as shown is attached to the perforated wall on the right side of the unused low frequency oscillator compartment. (If your ART-13 has a low frequency oscillator installed, you must remove it or hunt another spot.)

The connections are made to the contacts of P2601 which takes the place of the LFO unit. Be sure not to omit the 150K "firing resistor" because often the voltage is not high enough to start the OA2 if the OB2 should try to fire first.

With regulators mounted, the only task that remains is to remove the ground lead from R120. This is easier said than done because this resistor is located behind the autotune mechanism of control "D". However, with the autotune mechanism removed, the wires (there are actually two) can be removed from the top of the resistor and taped together.



In operation, the OA2 and OB2 tubes in series regulate the voltage to approximately 255V, while carrying about 20mA. These are good values for good stable operation in every way.

My modification was strictly "junk box," but some of you may have to spend $3.58 for the tubes and resistor. I was also lucky and have only $26 in my transmitter and homebrew power supply. Some of you may have spent a little more, but one thing is for sure: Making simple improvements, such as this one, to your ART-13 will give you pleasure and satisfaction that the "expensive rig hams" are sure to miss. It is this type of activity that keeps me a licensed amateur operating a homebrew receiver and an old "airplane anchor."

. . . WA9IHV

NES

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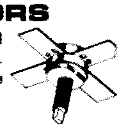

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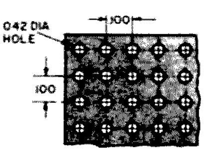

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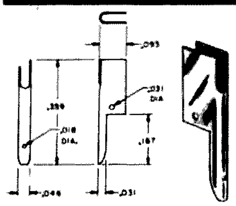
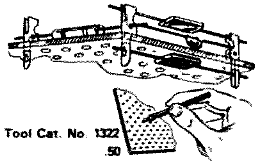


The terminal is easily press-fit into a .042 dia. hole without staking or the base may be flared for permanent installations. Ideally designed for use in micro-circuitry to support components when space is at a premium.



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ESTIMATING POWER TRANSFORMER RATINGS

Junk box transformers sometimes have a way of losing their identity with time. It isn't too difficult to determine the voltages of the various windings, but current ratings are another matter. I have found the best approach is to first get an idea of the overall power rating of the transformer. This is determined primarily by the amount of copper and iron in the transformer, so as an approximation the weight of the transformer will tell us roughly how many watts a transformer will handle.

With this idea in mind, several transformers of known ratings were weighed and their "watts per pound" determined by dividing the wattage rating by the weight. Here are some typical results:

Transformer Type	Watts	Wt/lb.	Watts/lb.
TV power	300	13.5	22.2
old radio power	132	7.5	17.6
battery charger	600	24.0	25.0
small radio power	40	4.25	9.4
instrument power	20	1.6	12.5

Generally speaking, the larger the transformer, the more watts per pound you get. This is to be expected since a larger transformer is more efficient than a smaller one. The table may be used as a rough guide in determining the wattage rating of your transformer. Weigh the transformer and multiply the weight by the estimated watts per pound for that weight. Next estimate the plate and heater current requirements for your application to see if the total number of watts is within the transformer ratings.

A word of caution when checking transformer windings on the ac line. *Always* use a test lamp in series with the winding until you are sure the winding connected to the ac line is indeed the primary. An unloaded transformer will show little or no primary current (lamp very dim) with the primary connected to the line.

. . .W6FPO

John J. Schultz W2EEY
1829 Cornelia Street
Brooklyn NY 11227

THE QUIET MAKER

Low frequency audio filter for CW

Improving on a good idea from VU land: VU2NJ described recently (*QST*, February, 1972) some low-cost steps he took to improve the performance of his S4OA receiving setup. Most of the steps were quite conventional (adding voltage regulation, a converter, etc.) except perhaps for the means he used to improve the CW selectivity of the receiver. Apparently he didn't expect too many readers to immediately accept his approach to improved CW selectivity since floods of articles have appeared in magazines about audio filters for CW reception. Although his approach did not involve the usual audio peaking filter idea, it did involve shaping of only the audio passband in the receiver to improve CW reception. Basically, his idea was to copy CW at a very low pitch or beat frequency and then use an audio low pass filter to eliminate the higher frequencies and hence interference. The setting of the BFO in relation to the i-f passband would build one "wall" of what one can visualize as an overall filter and the other "wall" would be built by the low pass audio filter. Since only a low pass filter is involved there are none of the usual problems associated with a sharply peaked audio filter.

I was also dubious about the value of the idea but decided to give it a try, first in the form described by VU2JN which consisted mainly of just inserting a three section RC low pass filter between high impedance points in the audio amplifier stages in the S4OA. A similar audio filter was installed between the audio stages of a tube type transceiver. The results were really quite surprising. Copying CW signals at low beat notes of a few hundred Hz, one would notice a marked improvement in apparent signal selectivity and the higher pitched rasping frequencies were noticeably reduced so that the overall reception appeared quieter. The method hardly produced the selectivity results of a good i-f CW filter as VU2JN tended to claim but the method certainly had something to it and deserved further study.

The original RC low pass filter provided only a very gradual rolloff characterisitc or

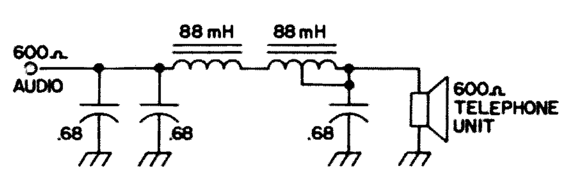

Fig. 1. Circuit of basic filter. Capacitors should be mylar. Half of one 88 mH toroid is shorted out.

attenuation of the frequencies higher than about 100 Hz. Also, although theoretically it shouldn't have been the case, the filter seemed to have too much insertion loss even at the very low frequencies requiring that the volume control on the transceiver be run wide open. The answer was to build a good low pass filter from LC elements. Building such a filter at the high impedance levels existing between tube stages would require very high values of inductance and hence expensive components. Also, since it doesn't make any difference where in the audio chain the filter is used and, to avoid any digging into the transceiver with which the filter was to be eventually used, it was decided to build an outboard filter. My rig has audio outputs available at both the 8 and 600Ω levels. The filter finally used was constructed for use in the 600Ω output since this was presently being used to drive a 'speaker." The "speaker" in use incidentally, was a receiver unit from a standard Western Electric telephone handset (Fair Radio Sales, Lima, Ohio, sells surplus telephone items.) The receiver unit is mounted in a small 7.62 x 10.16 cm bakelite enclosure with a few holes drilled in front to act as a grill and acts as an excellent SSB speaker because of its shaped communications type frequency response. The basic receiver unit will also act as an excellent dynamic microphone for SSB. But let's return to the filter description. A standard low pass filter was calculated for 600Ω and inserted in the speaker line. The final component values were then determined by experiment. The final circuit is shown in fig 1. The filter provides a sharp attenuation of frequencies above about 400 Hz.

Using the LC filter, the value of the low beat note type of CW reception could really be appreciated and it is really better than any type of peaked audio filter method of CW selectivity. There is absolutely no ringing to the circuit since a resonant filter is not involved. The reception is extremely quiet since all of the sharp high pitched notes which contribute to noisiness as well as fatigue in reception are eliminated. One can be receiving a signal with a 200 – 300 Hz pitch perfectly comfortably and then switch the filter out and hear other signals which

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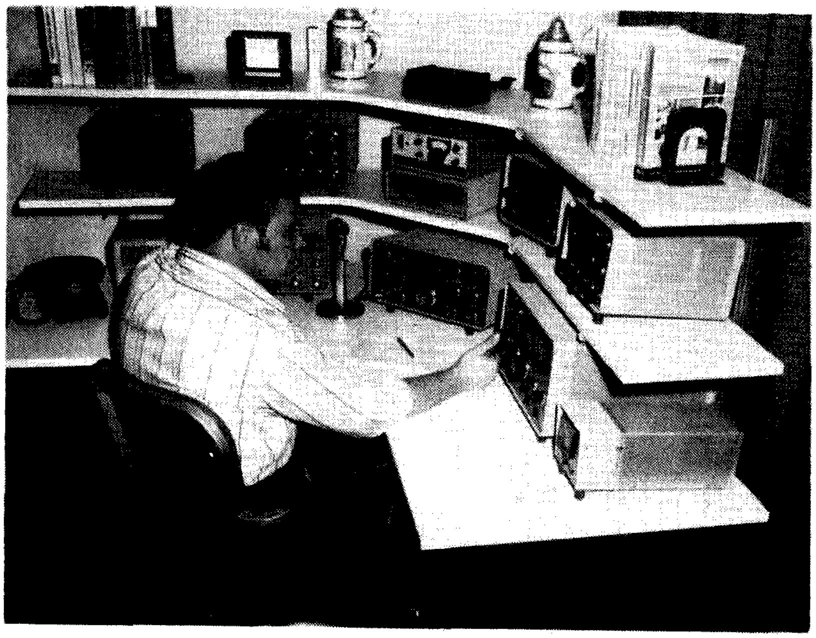

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would have made reception of the desired signal impossible without the filter. For the few dollars for parts, the filter is undoubtedly one of the best and easiest ways to improve the CW reception of a SSB transceiver. Better than a CW i-f filter? No. No audio filter will every replace a proper i-f filter but the filter described does come awful close.

A few additional notes about the filter are in order. The cutoff frequency of the filter shown in Fig. 1 is higher than VU2JN proposed but by trial and error I found it to be the best sounding arrangement. Others may wish to construct a filter with a still lower cutoff frequency perhaps going down to the 100 Hz VU2JN favored; I simply found the extremely low frequency beat note sounded too dull and lifeless to enjoy copying. If such a low cutoff frequency is used, however, it may be necessary to improve the basic low frequency gain of the audio section in a transceiver. This can be done usually by increasing by an order of 10 or more the value of the interstage coupling capacitors. There is no need to remove the filter when tuning across a CW band since one will not miss signals as is often the case when a sharply peaked single frequency CW filter is used. The filter does, of course, have to be removed for SSB reception although a modified version of the filter as described next does have value even for SSB reception. One may be inclined to construct the filter with multiple LC sections but my experience was that adding another pi section to the filter of Fig. 1 contributed only a barely noticeable improvement in performance. It appeared to be far more useful to experiment slightly with the capacitors in the pi

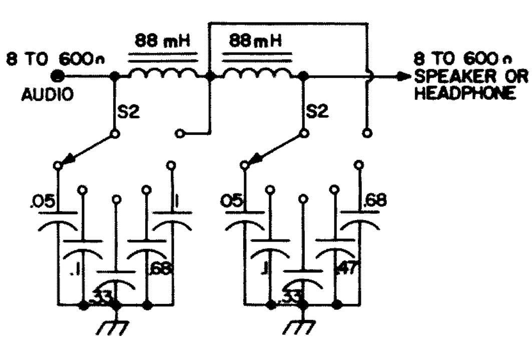

Fig. 2. Switchable filter allows wide selection of frequency roll-offs for CW or phone work.

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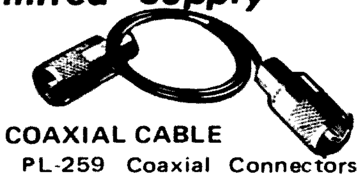

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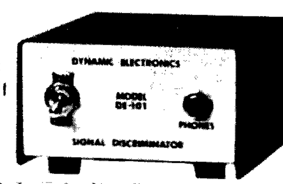

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section to achieve the best attenuation of the higher frequencies. The capacitors used should be of the Mylar type, if possible.

The success of the simple filter prompted the author to also check if such a filter might have some value for phone reception. The filter of Fig. 1 has far too low a cutoff frequency to be usable on phone. I tried it on a phone signal and it almost completely destroyed the intelligibility of the signal. Low pass filters have often been used with cutoffs of 2500 to 3000 Hz to improve SSB reception and so it was decided to see if the filter characterisitcs could be modified by just changing the capacitor values to yield a higher cut-off frequency. By experimenting with different capacitor values, it was found that the cutoff frequency could be raised with a good degree of effectiveness to several thousand Hz although the filter no longer represented a proper textbook formula design. Exactly where one might desire to roll off the cutoff of the filter for phone reception becomes much more subjective than with CW reception. Therefore, if one were to build such a filter for both CW and phone use, it would be advisable to provide a range of frequency cutoff options. The circuit of Fig. 2 shows a filter with a wide range of switch selected capacitor values which in turn will provide suitable cutoff frequencies for the filter for either phone or CW reception. If the filter is built for use with a different impedance system, some simple experimentation with the capacitor values and number of toroid inductors used will quickly provide the correct values. An important point to remember when experimenting with this type of filter is that the textbook values for the nominal impedances of the components involved often do not apply. The speaker or headphones in use may well have a nominal impedance of 8Ω, for instance, but at a particular frequency the actual impedance may vary several times from this value.

After having tried the filter idea just described, I feel much the same as VU2JN did. The whole idea appears too simple to be worth while or effective, or not to have been thought of before. But it does work and indeed works fine. Give it a try.

. . .W2EEY

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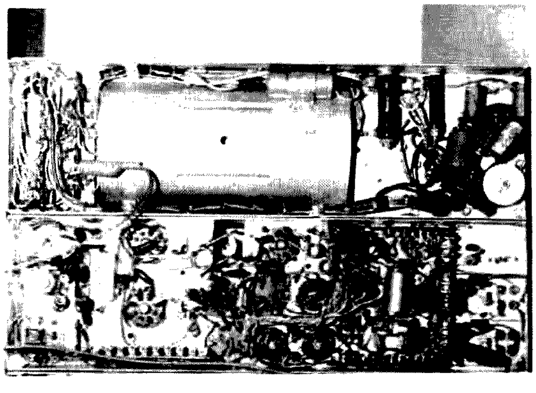
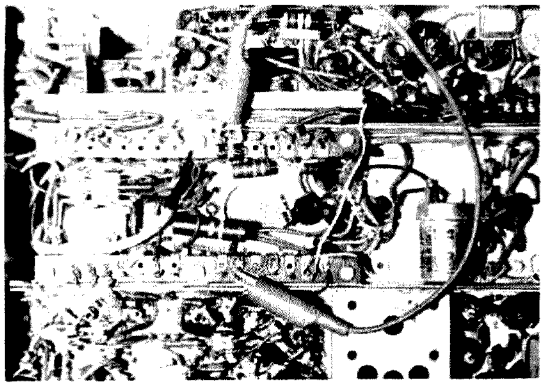
Use a 50 mA meter with the positive lead to ground and the negative lead to pin 4 on the receiver meter plug. The repeater can be used as a frequency standard.

While listening to a conversation on the repeater, check the meter reading. It should read zero. If it does not, adjust the receiver crystal oscillator for a zero reading (the small can right next to the crystal). You may have to consult a schematic if you are not sure which can is the crystal trimmer. An insulated tool is needed for this, a plastic screwdriver. Metal will detune the circuit. If the meter reading is below zero, reversing the meter pin will provide an up scale reading.

To net the transmitter to the receiver, jumper the receiver B+ voltage to the transmitter low B+ or multiplier circuit. This will provide a signal from the transmitter and if it does not read zero on the meter, adjust the transmitter oscillator capacitor for a zero reading on the meter. Transmitter adjustment is usually a slotted shaft on top of the chassis near the crystal (ordinary screwdriver may be used).



Motorola 80-D.



Motorola 41-V. Pin 10 (l), pins 6 & 7 (r).

On the Motorola 80-D and 140-D, jumper from power supply terminal strip pin 9 to oscillator deck pin 2 on any of the three decks.

On the Motorola 41-V, jumper between receiver terminal strips pin 10 and transmitter terminal strip pins 6 and 7.

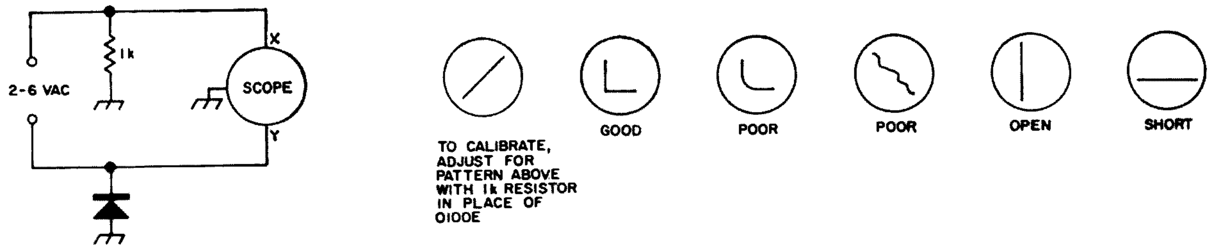
Jumper for a short period of time only.

. . . WA0GUD

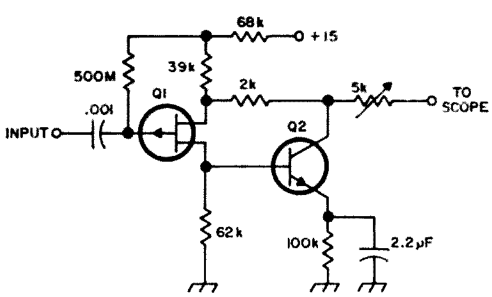
CIRCUITS, CIRCUITS, CIRCUITS...

The following circuits have appeared in the referenced books, magazines, application notes, etc. While we try to reproduce all of the information that should be needed by an experienced constructor, readers may want to avail themselves of the original sources for peace of mind.

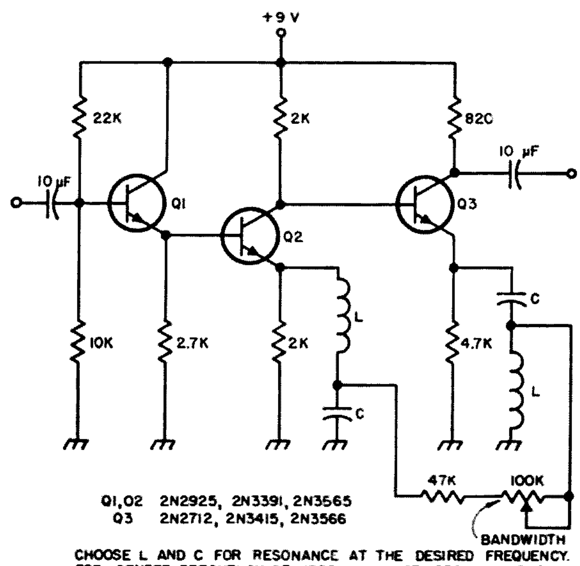
Readers are requested to pass along any interesting circuits that they discover in sources other than U.S. ham magazines. Circuits should be oriented toward amateur radio and experimentation rather than industrial or computer technology. Submit circuit with all parts values on it, a very brief explanation of the circuit and any additional parts information required, give the source and a note of permission to reprint from the copyright holder, if any, and the reward for a published circuit will be a choice of a 73 book. Send your circuits to 73 Circuits Page, 73 Magazine, Peterborough NH 03458.



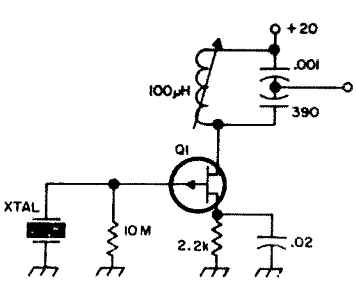
One of the easiest types of diode checks for a person with a scope is this, but it tells nothing about a diode's high voltage performance.



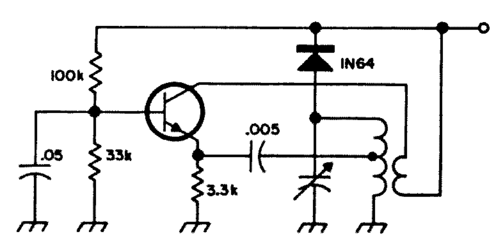
This high impedance probe provides about 1200 megohms input impedance with unity gain. Upper frequency equalization is provided by the 5K pot. Q1 is a U112, 2N2607, 2N4360 or T1M12; Q2 is a 2N706, 2N708, 2N2926, 2N3394, or HEP-50.



This three stage audio filter uses two series resonant circuits to provide a very narrow audio passband. The Q of the circuits, and therefore the bandwidth, is controlled by the amount of feedback.



This is the old familiar vacuum tube Pierce oscillator circuit with a field effect transistor in place of the thermionic triode. Circuit constants shown here are for the 1 MHz region, but the tuned circuit may be adjusted to any frequency desired. Q1 is a 2N4360 or T1M12.



This circuit uses a diode to limit the output of an oscillator.

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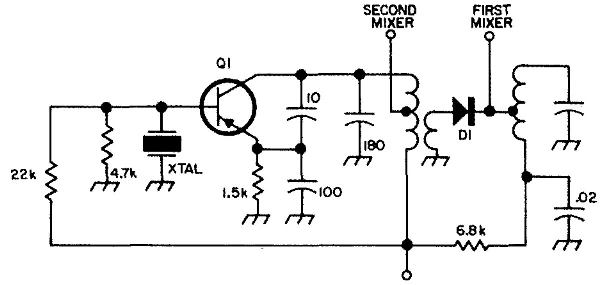
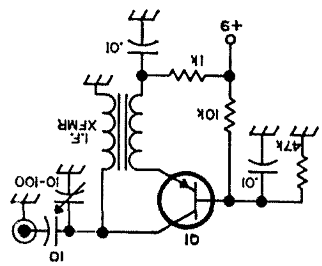
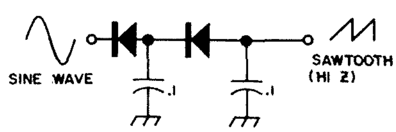


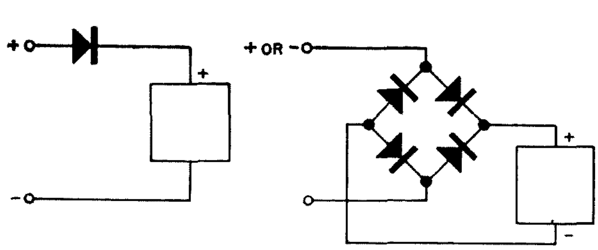
Single oscillator and diode provide two injection frequencies for dual conversion receivers. Transistor Q1 is a 2N1745, 2N2188, TIM10, GE-9 or HEP-2; the diode should be a 1N82A or similar.



This beat frequency oscillator may be added to existing receivers with a minimum of difficulty. The BFO frequency is determined by the i-f transformer which provides feedback from collector to emitter. Transistor Q1 should be a 2N384, 2N1749, 2N2362, T1M10, SK3008, GE-9 or HEP-2.

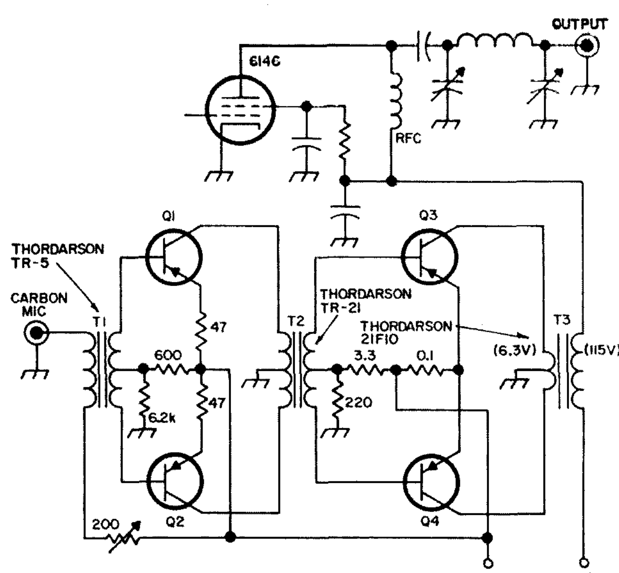


This simple sawtooth generator could be added to a monitor oscilloscope.



(A) (B)

These two circuits protect equipment from incorrectly polarized voltage. The single diode keeps the equipment from working when the polarity is wrong, while the bridge automatically selects the proper polarity.



25 watt modulator uses readily available commercial transformers. Transistors Q1 and Q2 are 2N1172, 2N301, 2N1560, SK3009, GE-9 or HEP-232; Q3 and Q4 are 2N174, 2N278, SK3012, GE-4 or HEP-233.

Ronald B. Cohen K3ZKO/AFA3ZKO
6629 N. 5th Street
Philadelphia PA 19126

THE AM 1187/TRC ON 450 MHz

This is not really a conversion article. There isn't any converting to be done to place this little gem into operation on any frequency from 400 MHz to 600 MHz.

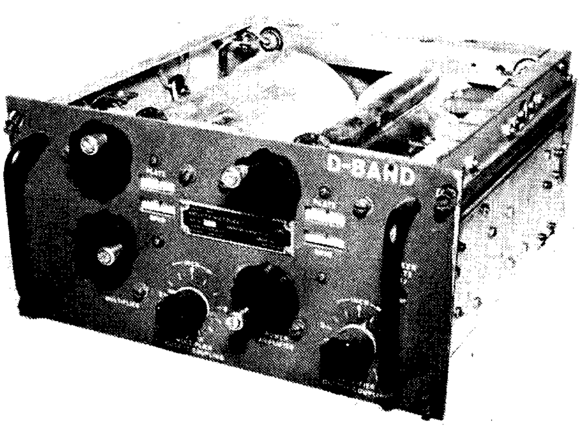
The plug-in unit that we are discussing is the "D" band tuning head from the AN/TRC-24 radio transmitter T-302/TRC. This plug-in consists of two cavities. The first is a multiplier tripling up from two meters. Output in the 400 MHz to 600 MHz range from the multiplier is fed to the second cavity which is a straight-through power amplifier.

In the multiplier stage a 4X150A tube is used. The final amplifier uses a 4X150G tube. The 4X150G tube uses 2.5 volts at 6 amps on the filament. A much better tube to use in the final stage is a 4CX250K with a filament voltage of 6.3 volts at 2.5 amps.

These "D" band heads can be used in many different arrangements. The first approach is not to modify anything but to apply the proper voltages to the ribbon connector on the rear of the unit and feed a two meter signal to the input. The output at 432 MHz will be approximately 150 watts depending on the voltages used and the amount of two meter drive that is used.

The second method is to use only the power amplifier. Disconnect the "N" connector P3 from the multiplier cavity and feed your low power FM, AM, SSB or ATV 432 MHz signal into this plug. The final could also be grid or plate modulated with external modulators.

The third and last way is to use the multiplier/amplifier for ATV. Using the



The D-Band tuning bead can be operated as a 2m to ¾m tripler/amplifier without conversion, as the cavities can be tuned to range from the front panel. Using the final only with a 4CX250K tube we have obtained the following results:

PLATE VOLTAGE	*2000V dc*
PLATE CURRENT	*250 mA*
SCREEN VOLTS	*250V*
GRID RF DRIVE	*10W*

This resulted in 500W dc input and a measured output of 350W.

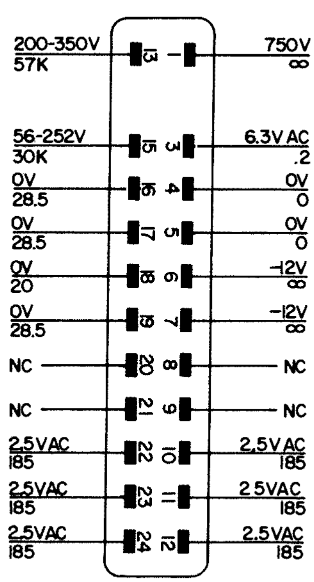
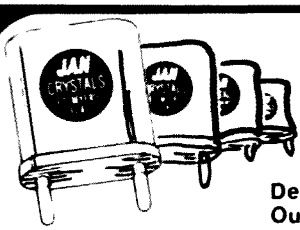


Fig. 1. Identification scheme for the ribbon connector on the rear of the unit. Upper values are operating voltages and lower values indicate the proper resistance as measured through the terminals from ground.



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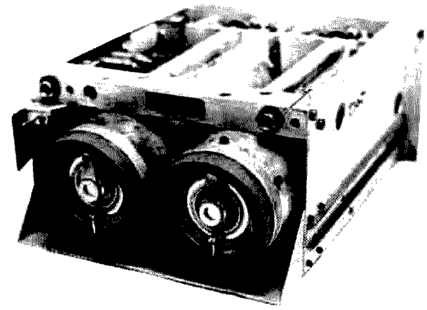


Rear view of the tuning unit showing the tubes mounted in the cavities. Note – never operate the cavities without proper air flow through them.

W6ORG video modulator[1] with an RCA CMU-15 Carfone transmitter strip, the output can be fed into the input of the amplifier through the N connector P3. You will be using the amplifier as a linear. The second method is to grid modulate using the W8VCO video modulator[2]. The main disadvantage of going this way is that the grid feedthrough capacitor C20 must be removed. If C20 is not removed the video bandwidth will be only about 500 kHz. There will still be a loss in bandwidth with C20 removed but the pictures will look good enough.

In tuning up with video a detected output to a scope is a must. The amplifier is tuned looking at the detected video making sure that the sync is not clipped or that the whites are going into saturation. With video transmission the best picture will not occur with the maximum forward power out of the amplifier.

Be sure to use an adjustable bias supply so you will have protection for the tube and control of operating point of the tube.

Tuning for CW conditions requires adjusting the plate, grid and load controls several times as you monitor the forward power. A final peak will then be reached with the power output.

Many of these AM-1187 heads are available through the MARS programs. We hope to see you soon on 439.250 MHz ATV with high power.

. . .K3ZKO/AFA3ZKO

1. *ATV Video Modulator* 73 *June 1969 W6ORG Tom O'Hara.*
2. *Video Modulation* 73 *August 1963 W8VCO Robert Walker.*

Jay Walton W5ACK
112 Island Drive
Richardson TX 75080

THE DRAKE R4B USED AS A 2m SIGNAL GENERATOR

Any owner of a Drake R4B can attest that it is one fabulous receiver. Not only is it great for its intended use, but there have appeared from time to time in the various journals methods by which the R4B could be tuned to "out-band" signals, such as WWV, with the crystals supplied for normal ham band use.

Related to this, but not exactly the same, I have found that the Drake crystal oscillator, PTO, and mixer can be used for a fairly accurate variable frequency signal generator and frequency meter for use on two meters, while at the same time maintaining the frequency resolution of the basic R4B PTO readout.

By using a crystal with a 0.0001% tolerance, frequency on two meters can be measured with approximately ±150 Hz ±PTO reading accuracy ±PTO linearity accuracy. That may seem like an awful lot of pluses and minuses, but it all adds up to about 300 Hz, or about 2 parts in 1 million. If we had that kind of accuracy on the low bands, it would come to about 6 Hz on the 3 MHz band. This is the poor man's way of measuring frequency on two meters with reasonable accuracy.

The uses for this capability are apparent. You can calibrate your discriminator for measuring the other fellow's deviation, or your own if you happen to have another receiver tuned to your transmitter output frequency. You can measure or confirm repeater frequencies. This method is by no means a commercial test set method; it is merely a ham's way of doing something within the realm of the average pocketbook.

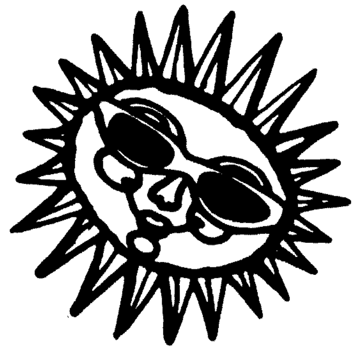
Table I lists the crystal frequencies necessary for using the R4B dial conventionally to cover the entire two meter band. Of course, only those ranges of interest to you can be used.

These crystals should be specified for use in the Drake R4B and should have a 0.0001% tolerance. This will insure the 150 Hz deviation mentioned above. Crystals for use in other than the Drake units could result in deviations from nominal greater than the specified 0.0001%.

Table I

Tuning Range (MHz)	Crystal Frequency (MHz)
144.0–144.5	37.363750
144.5–145.0	37.488750
145.0–145.5	37.613750
145.5–146.0	37.738750
146.0–146.5	37.863750
146.5–147.0	37.988750
147.0–147.5	38.113750
147.5–148.0	38.238750

Bold City Hamfest



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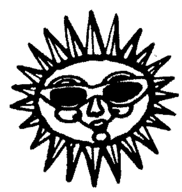


BOLD CITY HAMFEST
1644 MILL CREEK ROAD
JACKSONVILLE, FLORIDA 32211
PHONE (904) 725-5473

The tuning range can be extended either side of the two meter band for special frequencies (MARS, commercial, etc.), by increasing or decreasing the crystal frequency by 125 kHz for each 500 kHz change in tuning range desired. For example, to tune from 148.0 to 148.5 MHz, the crystal required would be 38.238750 MHz plus 125 kHz, or 38.363750 MHz.

To use the crystal with the R4B, select the desired crystal with the XTALS switch to tune the desired range, place the R4B BAND switch in the 28.5 position, and tune the dial to the appropriate frequency of interest within the tuning range just as you would if you were using the receiver on the low frequencies. If the signal injection is not strong enough by pickup from your normal R4B operating configuration (two units I have can hear it fine), added signal can be obtained by taking the signal from the INJ jack on the back of the R4B. *Caution: If you are connected to a transceiver, do not transmit or it is goodbye R4B. Be careful and always on your toes.*

The setting of the PRESELECTOR is immaterial, although some peaking of the signal can be noted with the PRESELECTOR around the 15 to 10 meter positions, but this peaking is only in the order of 3 dB or so.

For those of you who might have the desire to know what frequency range you would tune using these special crystals in the "normal" manner, just subtract 11.1 MHz from the crystal frequency to determine the low end of the 500 kHz tuning range. For example, if you have the crystal which would permit tuning 146.0–146.5 MHz selected, and you use it in the normal manner, the low end of the PTO tuning will be at (37.863750 minus 11.1) MHz, or 26.763750 MHz.

. . .W5ACK

Editor's Note:

International Crystal's type CS-O5, ±.0025% crystals cost about five to ten dollars. Their oscillator unit OE-5 can be processed and adjusted to within .0001% for considerably more. The standard CS-O5 37 MHz crystal costs in the neighborhood of $7.50.

Walter W. Pinner WB4MYL
7304 Lorenzo Lane
Louisville KY 40228

FM CONVERSION OF G.E. LOW POWER INDUSTRIAL TRANSCEIVERS

Many of these units are showing up at hamfests in the \$20 to \$40 price range. They are available with either a dc vibrator or a 115 ac built-in power supply. A receiver sensitivity of .7 µV and a transmitter output of 3W is easily obtained with the following information.

Necessary Equipment

Grid dipmeter or indicating wavemeter, 50 µA to 100 µA meter (almost any vom will do if a separate meter is not available). A 50Ω dummy load (2 parallel 100Ω 2W resistors) or a No. 47 pilot lamp and the proper crystals. Crystals should be purchased from a reputable supplier. The cost will be about \$12 per set and you should supply the following information when ordering.

Receiver model number (stamped on side of chassis); *desired receive frequency* (146.94 MHz); *oven or non-oven type* (these units usually are non-oven type); *transmitter model number* (stamped on side of chassis); and *transmit frequency* (146.94 MHz).

While you are waiting for the crystals to arrive you can perform the following modifications.

1. On the transmitter chassis, compress the coil at C119 tightly together (all the components referred to are plainly marked on the chassis top).
2. On the transmitter add one turn or re-wind with one additional turn, the two coils at C-124A and C-124B.
3. Jumper out the 2.7K 2W resistor connected to J114. This is under the chassis and near the 6AN5 output tube.

This completes the modifications. All that remains is realignment. When the crys-

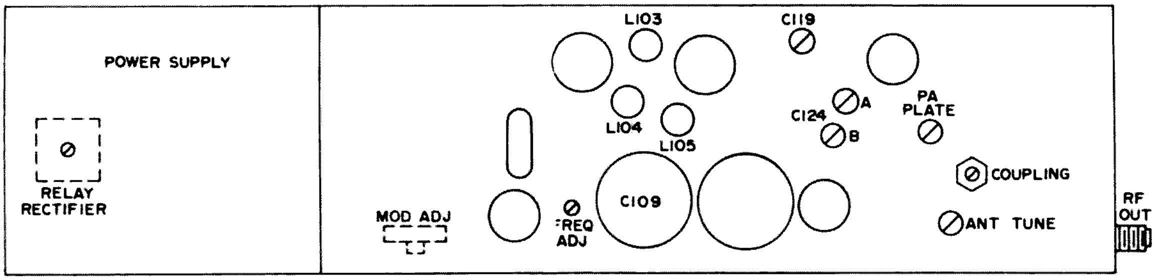


Fig. 1. Transmitter

tals arrive, install them in the proper sockets and you are ready to align the transmitter. Connect an swr bridge and dummy load to the antenna connector. You may also use a No. 47 lamp as an indicator/load. When properly tuned the No. 47 lamp will light to normal or better brightness. Remove the 6AN5 output tube from its socket. To key the transmitter for the following steps, depress the red test switch located on top of the chassis near the control head. Apply power to the unit and with the dipmeter or wavemeter set to about 12 MHz, couple to coil L-103 and adjust L-103 for maximum indication. In the same manner adjust L-104 for maximum indication at 12 MHz. Set the dipmeter for 36 MHz and couple to and adjust L-105 for maximum output. Set dipmeter to 73 MHz, couple to and adjust C-119 for maximum output from L-107. Set dipmeter to 146 MHz, couple to L-109 and adjust C-124A for maximum output. Reinstall the 6AN5 tube and using the swr bridge or No. 47 lamp as an indicator, key the transmitter and tune C-124B, C-128 (P.A. Plate), and C-129 (antenna tune) for maximum output. Double check the output at the 6AN5 tank coil for 146 MHz output with the dipmeter. This completes the transmitter tuneup.

Receiver Alignment

Couple the dipmeter or wavemeter to the bottom of Z-306 and adjust Z-305 and Z306 for best output at about 139 MHz. Only a slight adjustment inward will be necessary on these two coils. If you have ordered crystals for simplex (transmit and receive on the same frequency) you may use the transmitter as a signal source for the remainder of the alignment by connecting a jumper from any red B-plus transmitter lead to any red B-plus receiver lead. The dummy load should be moved from the antenna jack to the antenna relay below the chassis. Connect the load to the relay terminal that connects to C-125 the antenna tune capacitor. Connect the 50 μA meter betweeen the green limiter jack, near the volume control, and ground. With the B-plus to B-plus jumper in place, adjust the following in the order given: Z-304, Z-303, Z-302, Z-301, T-301 for maximum meter reading. Once this preliminary alignment has been accomplished, move the meter to the orange Disc. jack. Adjust L-307 for a "0" current reading. You should be able to vary the receive crystal frequency for an indication above and below 0. Having done this, you know *your* transmitter and receiver are on the same frequency. You may now make a final

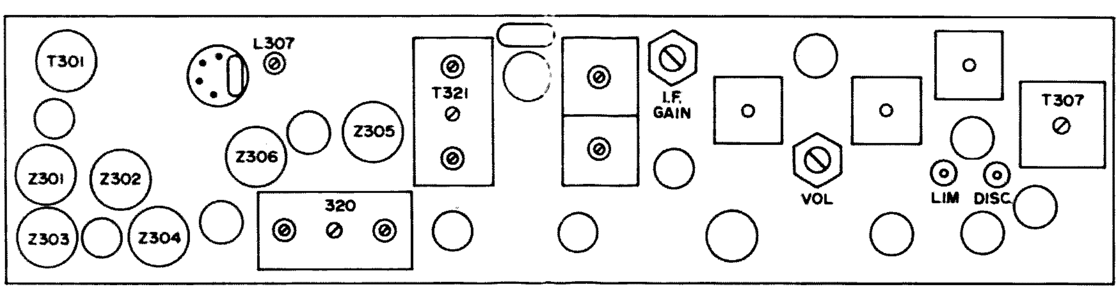


Fig. 2. Receiver

receiver tuneup. Remove the 6AN5 tube to reduce the signal and with the meter in the green Lim jack, as before adjust Z-304 through T-301 for maximum meter reading. You may wish to reduce the setting of the i-f gain control for this final adjustment. Remove the B-plus jumper, dummy load, and replace the 6AN5 tube.

Final Frequency Adjustment

While receiving an on-the-air signal such as the local repeater or other station as a standard, meter the discriminator current and adjust L-307 for 0 current indication. Reinstall the B-plus jumper and adjust the transmitter crystal trimmer (freq, adj.) for 0 reading. Your receiver and transmitter are now on the reference station's frequency. The modulation or frequency deviation is adjustable up to 20 kHz. An on-the-air audio report is the simplest way to make this adjustment, if necessary.

Service Hints

Below is a list of common problems you may experience.

Relay chatter – replace the bridge rectifier on the bottom of the power supply chassis – a common failure. 100 piv 1A diodes are o.k.

No or weak receive– i-f transformers T320 or T321 will open where the coil leads attach to the terminal internally. This is easily repaired by removing the transformer. Disassemble and resolder the connection.

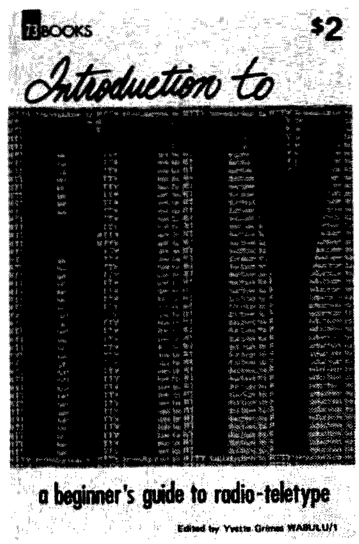
Poor audio – mike voltage is developed at the cathode of the 6AK6 transmitter tube. Check for proper transmitter alignment, good 6AK6 tube, and replace C109 the mike voltage filter.

Unable to align transmitter – several units converted had faulty trimmer caps. C-117, C-124 A&B, Antenna tune. Mechanically these caps would rotate, but they did not change electrically. This fault may be detected by a slight irregularity in the force needed to rotate them.

In conclusion, mobile units seem to be less expensive than units with ac supplies. Should you elect to build your own ac supply, you will need the following voltages: B-plus – 200V dc @ 145 mA, relay dc – 9V dc @ .5A, fil. ac – 6.3 @ 5.5A or 12.6 @ 3A.

. . .WB4MYL

NUDE picture IN THIS AD?



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*They tried to prevent us from publishing a transcribed picture of the Swedish Nude, but we did it anyway!

FCC RULES AND REGULATIONS, PART 97 (VIII)

Continuing from December, the complete test of the FCC Rules and Regulations pertaining to the Amateur Radio Service.

Subpart F—Radio Amateur Civil Emergency Service (RACES)

TECHNICAL REQUIREMENTS

§ 97.193 Frequencies available.

(a) Except as provided in paragraph (e) of this section, the following frequency and frequency bands and associated emissions are available on a nonexclusive basis to the individual class of stations or units of such stations in the Radio Amateur Civil Emergency Service.

(1) For use only by authorized stations or units of such stations which are operated under the direct supervision of duly designated and responsible officials of the civil defense organization:

Frequency band:	Authorized emission
1800–1825 kHz [1]	0.1A1, 1.1F1, 6A3
1975–2000 kHz [1]	0.1A1, 1.1F1, 6A3
3500–3510 kHz	0.1A1, 1.1F1
3990–4000 kHz	0.1A1, 1.1F1, 6A3, 6F3

[1] Use of frequencies in the band 1800–2000 kHz is subject to the priority of the Loran system of radionavigation in this band and to the geographical, frequency, emission, and power limitations contained in § 97.61 of the rules governing amateur radio stations and operators (Subparts A through E of this part). The use of these frequencies by stations authorized to be operated in the Radio Amateur Civil Emergency Service shall not be a bar to expansion of the radionavigation (Loran) service, and such use shall be considered temporary in the sense that it shall remain subject to cancellation or to revision, in whole or in part, without hearing, whenever the Commission shall deem such cancellation or revision to be necessary or desirable in the light of the priority within this band of the Loran system of radionavigation.

(2) For use by all authorized stations only in the continental United States, except that, the bands 7245–7255 and 14.220–14.230 kHz are also available in Alaska, Hawaii, Puerto Rico, and the Virgin Islands:

Frequency band:	Authorized emission
3510–3516 kHz	0.1A1, 1.1F1.
3516–3550 kHz [1]	0.1A1, 1.1F1.
3984–3990 kHz	0.1A1, 1.1F1, 6A3, 6F3.
7097–7103 kHz	0.1A1, 1.1F1.
7103–7125 kHz [1]	0.1A1, 1.1F1.
7245–7255 kHz [1]	0.1A1, 1.1F1, 6A3, 6F3.
14047–14053 kHz	0.1A1, 1.1F1.
14220–14230 kHz [1]	0.1A1, 1.1F1, 6A3, 6F3.
21047–21053 kHz	0.1A1, 1.1F1.

[1] The availability of the frequency bands 3516–3550 kHz, 7103–7125 kHz, 7245–7247 kHz, 7253–7255 kHz, 14220–14222 kHz and 14228–14230 kHz for use during periods of actual civil defense emergency is limited to the initial 30 days of such emergency, unless otherwise ordered by the Commission.

(3) For use by all authorized stations:

Frequency or frequency bands:	Authorized emission
3997 kHz [1]	0.1A1, 6A3.
28.55–28.75 MHz	0.1A1, 6A3, 6F3, 6A4.
29.45–29.65 MHz	0.1A1, 1.1F1, 6A3, 6A4, 40F3.
50.35–50.75 MHz	0.1A1, 6A2, 6F2, 6A3, 6F3, 6A4.
53.30 MHz [1]	40F3.
53.35–53.75 MHz	0.1A1, 1.1F1, 6A2, 6F2, 6A3, 6A4, 40F3.
145.17–145.71 MHz.	0.1A1, 1.1F1, 6A2, 6F2, 6A3, 6A4, 40F3.
146.79–147.33 MHz.	0.1A1, 1.1F1, 6A2, 6F2, 6A3, 6A4, 40F3.
220–225 MHz	0.1A1, 1.1F1, 6A2, 6F2, 6A3, 6A4, 40F3.

[1] For use in emergency areas when required to make initial contact with military units; also, for communication with military stations on matters requiring coordination.

(b) The selection and use of specific frequencies within the authorized frequency bands by stations in the Radio Amateur Civil Emergency Service shall be in accordance with a coordinated local area and adjacent area civil defense communications plan and applicable rules of this part.

(c) Except as provided in paragraph (d) of this section, at such time as any or all of these frequency bands are withdrawn from availability to stations operating in the Amateur Radio Service, such bands shall be jointly available to stations in the Radio Amateur Civil Emergency Service and to stations in the military services for training and tactical operations. At that time, in areas where interference might occur, local mutual arrangements shall be made regarding times of operation such as to preclude or satisfactorily alleviate interference. In time of actual civil defense emergency, stations in the Radio Amateur Civil Emergency Service shall have absolute priority.

(d) In the band 220 to 225 MHz, stations operating in the Radio Amateur Civil Emergency Service shall not at any time cause harmful interference to the government radiolocation service.

(e) A repeater station in the Radio Amateur Civil Emergency Service may operate on any frequency, and with any associated emission, above 50 MHz listed in paragraph (a) of this section, except for 220 MHz to 222 MHz.

[*§ 97.193(a) amended and (e) added eff. 10-17-72; VI(72)-1*]

§ 97.195 Classification of emissions.

(a) For the purposes of this subpart, the authorized emissions, as contained in the table of § 97.193, are defined as follows:

0.1A1—Continuous wave telegraphy.
1.1F1—Frequency shift telegraphy.
6A2—Telegraphy amplitude modulated at audio frequency.
6F2—Telegraphy frequency modulated at audio frequency.
6A3—Commercial quality amplitude modulated telephony.

6F3—Narrow band frequency or phase modulated telephony.
40F3—Wide band frequency or phase modulated telephony.
6A4—Amplitude modulated facsimile.

(b) On frequencies where wide band frequency or phase modulated telephony (40F3) is authorized, narrow band frequency or phase modulated telephony (6F3) may also be employed; similarly, where commercial quality amplitude modulated telephony (6A3) is authorized, single or double sideband amplitude modulated telephony, with or without carrier or with reduced carrier, may also be employed.

§ 97.197 Transmitter power.

The transmitting equipment of a radio station in this service shall be adjusted in such manner as to produce the minimum radiation necessary to carry out the communications desired. No station operating in this service shall use a direct current plate power input to the vacuum tube or tubes supplying energy to the antenna in excess of that permitted to be used by a licensed amateur radio station when operated on the same frequencies or in the same frequency bands in accordance with the provisions of the rules governing amateur radio stations and operators (Subparts A through E of this part).

§ 97.199 Equipment requirements.

(a) Except under the conditions specified in paragraph (b) of this section, all stations authorized to be operated in the Radio Amateur Civil Emergency Service shall be capable of receiving on the same frequencies or frequency bands utilized for transmission.

(b) When a station in this service is operated only on a single frequency or frequency band for cross-band operation in communication with a station or stations operating on another frequency or in another frequency band, or in other services, such station shall be capable of receiving the station with which it is communicating.

(c) The direct modulation of an oscillator with a frequency stability less than that obtainable with crystal control, or the radiation of a signal having simultaneous amplitude and frequency or phase modulation, is prohibited on frequencies below 220 MHz.

§ 97.201 Alleviation of harmful interference.

(a) When emissions of stations in the Radio Amateur Civil Emergency Service, other than those necessary to carry on the desired communications, cause harmful interference to stations in this or any other service, the Commission may, in its discretion, require appropriate technical changes in the equipment to alleviate the interference.

(b) When the emissions of stations in the Radio Amateur Civil Emergency Service that are necessary to carry on the desired communications cause harmful interference to stations in other radio services, appropriate action shall be taken to alleviate such interference including, if necessary, the suspension (except during times of an actual state of civil emergency) of such emissions as cause the interference.

Operating Requirements

§ 97.203 Operator requirements.

(a) No person shall operate a station in the Radio Amateur Civil Emergency Service unless (1) that person holds a valid radio operator license of the proper grade, as described in this section, and (2) that person holds a valid written certification by the chief of the local, regional, or state Civil Defense organization of the area in which he serves that he has satisfied all federal, state, and local requirements for enrollment in the Civil Defense organization as a radio operator and is actually enrolled therein. Such certification shall clearly indicate that a determination has been made as to his loyalty to the United States and general reliability in accordance with the procedures described in the approved civil defense communications plan for the area concerned. (See §§ 97.163(i) and 97.169.)

(b) The person manipulating the key of a manually operated radiotelegraph transmitter of a station authorized to operate in this service shall hold either (1) any class of amateur operator license issued by the Commission, other than the Technician or Novice Class, or (2) any class of commercial radiotelegraph operator license issued by the Commission other than the Temporary Limited Radiotelegraph Second Class Operator License, together with the certification required in accordance with the provisions of paragraph (a) of this section.

(c) Except as specifically provided in paragraphs (a) and (b) of this section, any station in the Radio Amateur Civil Emergency Service may be operated by the holder of any class of amateur or commercial radio operator license issued by the Commission other than a Temporary Limited Radiotelegraph Second Class Operator License or an Aircraft Radiotelephone Operator Authorization: *Provided*, That, when such operation is performed by the holder of a Novice Class amateur operator license or by the holder of a commercial radiotelephone or radiotelegraph third class operator license or restricted operator permit; (1) such operator shall be prohibited from making any adjustments that may result in improper transmitter opera-

tion, (2) the equipment shall be so designed and installed that none of the operations necessary to be performed during the course of the normal rendition of the service of the station may cause off-frequency operation or result in any unauthorized radiation, and (3) any needed adjustments of the transmitter that may affect the proper operation of the station shall be regularly made by or under the immediate supervision and responsibility of the holder of either an amateur operator license other than the Novice Class or a commercial radiotelephone or radiotelegraph first or second class operator license.

(d) All adjustments or tests during or coincident with the installation, servicing or maintenance of the transmitting equipment of a station in this service shall be made only by or under the immediate supervision and responsibility of the holder of either (1) an amateur operator license other than the Novice Class or (2) a commercial radiotelephone or radiotelegraph first or second class operator license issued by the Commission, who in addition holds the certification required in accordance with the provisions of paragraph (a) of this section.

§ 97.205 Operation at other than licensed location.

A station in this service, or any unit thereof, may be operated at any location in accordance with the approved civil defense communications plan for the area concerned, in the discretion of and as directed by the Civil Defense Radio Officer, without notice to the Commission and without limitation as to the length of time within which such operation takes place: *Provided*, That nothing in this section shall be construed to waive the necessity for modification of the authorization of a station in this service when the address of the licensee or the basic location of the station is changed, or for any other reason where, because of a change of the communications plan or other reason, the information heretofore furnished the Commission with the original application may be materially altered or changed.

§ 97.207 Availability of station authorizations and operator licenses.

(a) The original station authorization permitting operation of the licensed amateur station in the Radio Amateur Civil Emergency Service, or a photocopy thereof, shall be permanently attached to each transmitter of such station, including each transmitter which is capable of being operated and intended to be operated independently at different locations, if the transmitter is readily accessible, or, if the control position is located at a place other than the transmitter location, it may be posted at the control position: *Provided*, That, whenever a photocopy of the station authorization is utilized in compliance with the requirement of this paragraph, the original station authorization shall be made available for inspection upon reasonable request from any authorized representative of the Federal Government.

(b) The original radio operator license, or a verification card (FCC Form 758–F) in the case of the holder of a commercial radio operator license of the diploma type, of the operator controlling the emissions of a station authorized to be operated in this service together with the certification required by § 97.203(a), shall be carried on his person or kept immediately available at the place where he is operating the station or any independent unit of a station: *Provided*, That, whenever a verification card (FCC Form 758–F) is utilized in compliance with the requirement of this paragraph, the original operator license shall be made available for inspection upon reasonable request from an authorized representative of the Federal Government.

(c) When a licensed amateur station, or an independent unit of such station, is operated at a location other than that shown in its license in compliance with the provisions of this subpart, the basic amateur station license required by Subparts A through E of this part need not be readily available at the station or unit location, but shall be made available for inspection upon reasonable request from any authorized representative of the Federal Government.

§ 97.209 Radio station log.

(a) Except as otherwise expressly provided in this subpart, there shall be maintained at each radio amateur civil emergency station, or unit of such station, an accurate log of all operations. The following information shall be recorded in such station log:

(1) The name and address of the station licensee, the regularly assigned call sign of the station and unit number if any, the name of the radio amateur civil emergency network or networks in which the station is normally operated, and the d.c. plate power input to the vacuum tube or tubes supplying energy to the transmitting antenna system. This information need be entered only once in the log unless there is a change in any of the items specified in this subparagraph, but the original entry and each change shall show the date on which the entry was made.

(2) The date and time of beginning and end of each period during which the station was operated, the purpose of such operation, and the frequencies or bands of frequencies on which the operation took place.

(3) The call signs or other identification of all stations or units of such stations with which communications are established or attempted during such period of operation.

(4) The signature of the licensed operator on duty and in charge of the operation of the station or unit of such station during each period of operation, and the signature of each licensed operator who manipulated the key of any manually operated radiotelegraph transmitter of such station or unit. The signature of the operator shall be entered with the date and time at the beginning and end of each period during which he performed the foregoing duties, and at least once on each page additional to the first page, covering the period for which he was the responsible operator. The signatures of any additional operators who operate the transmitters(s) during the regular watch of another operator and details to indicate the periods during which they operated the transmitter(s) shall be entered in the proper form.

(5) Upon completion of each period of operation for any purpose, there shall be entered in the log a summary of such operation describing the nature thereof and, if message traffic or other record communications were exchanged with other stations, an estimate of the amount of such traffic handled together with a report on any unusual delays which were experienced in the delivery of such messages.

(6) There shall be no erasure, obliteration, or destruction of any part of the log of any station or station unit. Corrections shall be made by striking out the erroneous portion and initialing and dating the corrections.

(b) Mobile radio amateur civil emergency stations or station units, and portable radio amateur civil emergency stations or station units, where not being operated at pre-determined fixed locations, shall be

exempt from the requirements of maintaining a log to the extent that the entries required under the preceding paragraph of this section are substantially contained in the log of another station or stations operating in the same radio amateur civil emergency networks. All stations or station units operating in accordance with the provisions of this subpart shall be exempt from the requirements concerning station logs contained in Subpart D of this part whenever it is shown that compliance with these requirements would interfere with the expeditious handling of civil defense communications or communication drills.

(c) The current portion of the log shall be kept at the location of the operating or control position of the station or unit. Other portions of the log shall be retained by the licensee for a period of one year, at a place determined by the civil defense Radio Officer to be appropriate and advisable: *Provided*, That the logs of a station in this service shall be made available for inspection upon reasonable request by any authorized representative of the Federal Government: *And provided further*, That those portions of any log covering operation of a station in this service in connection with any actual condition jeopardizing the public safety or affecting the national defense or security shall not be destroyed unless prior approval for such destruction shall have been received from the Commission.

§ 97.211 Station identification.

(a) Stations operating in the Radio Amateur Civil Emergency Service shall identify themselves in the same manner and under the same conditions as prescribed in Subpart D of this Part, except that:

(1) Additional designators to indicate portable or mobile operation, or to indicate operation at a location other than that specified in the station license, shall not be used.

(2) When engaged in network operation, after a station or unit has been fully identified at least once, further identification by that station or unit may be accomplished by the use of abbreviated call signs or other distinctive signals prescribed by the civil defense Radio Officer in lieu of the call signs otherwise required to be transmitted by that station or unit. A record of such abbreviated call signs or other distinctive signals shall be maintained by the Radio Officer and shall be made available for inspection upon reasonable request by any authorized representative of the Federal Government.

(b) When two or more separate units of a station, which is authorized to be operated in the Radio Amateur Civil Emergency Service, are operated independently at different locations, each unit shall separately identify itself by the addition of a unit number at the end of its call sign. When transmitting by telegraphy such additional identification shall immediately follow the basic call sign and to avoid confusion with portable or mobile indicators, shall not be separated therefrom by the use of the "slant" or fraction bar, or other punctuation mark or symbol.

§ 97.213 Tactical call signs.

Stations operating in this service, and independent units of such stations, may be assigned tactical or secret call signs by the Commission or by competent civil defense authority, and may utilize such tactical call signs in lieu of the call signs appearing on the station licenses when such use is directed by competent civil defense authority: *Provided*, That a list of all such tactical call signs assigned stations under his direction shall be maintained by the civil defense Radio Officer and shall be made available for inspection upon reasonable request by any authorized representative of the Federal Government: *And provided further*, That when such tactical call signs are intended to be used at times other than during communications in connection with actual or impending conditions which appear to jeopardize the defense or security of the United States, a list of such tactical call signs and the stations or units to which assigned shall be furnished the Commission prior to such use.

USE OF STATIONS

§ 97.215 Limitations on use of stations.

(a) No station authorized to be operated in this service other than a control station as defined in this subpart, shall be operated for the purpose of transmitting any signal, message, or other communications except with the permission and under the operational control of the control station of the network in which it is operating: *Provided*, That nothing in the foregoing shall be construed to prohibit the transmission by any station or unit of a station of such signals as may be necessary for the purpose of alerting or making contact with the control station of the network, or for the purpose of transmitting actual emergency civil defense communications if the control station is disabled or is otherwise inoperative.

(b) Nothing in this section shall be construed to prevent the operation of a station which is authorized to be operated in this service for the purpose of brief tests or adjustments during or coincident with the installation, servicing or maintenance of such station: *Provided*, That the transmissions of that station during such tests or adjustments shall not cause harmful interference to the conduct of communications by any other station.

(c) No station in this service shall be used to transmit or to receive messages for hire, nor to transmit communications for material compensation, direct or indirect, paid or promised.

§ 97.217 Hours of operation.

Stations in this service may be operated at such times and under such conditions as may be prescribed by the Communications Officer or other responsible official of the civil defense organization having jurisdiction over the area which the station will serve: *Provided*, That the communications of such stations shall at all times be in accordance with the permissible communications authorized in this subpart.

§ 97.219 Points of communication.

Stations in this service may communicate with each other, with stations in the Disaster Communications Service, and with stations of the United States Government which are authorized to exchange communications with stations in this service by the particular agency having control. In addition, stations in this service may communicate, for the purpose of exchanging civil defense communications, with any other station in any service provided by the Commission's rules, whenever such station is authorized to communicate with stations in the Radio Amateur Civil Emergency Service by the provisions of the Commission's rules governing the class of station concerned or in accordance with the provisions of § 2.405 of this chapter.

TO BE CONTINUED NEXT MONTH

Terry Fox WB4JFI
3612 Barcroft View #302
Baileys Crossroads VA 22041

ATV may be the most exciting "new" facet of amateur radio. The word new is emphasized because ATV has been around for over 25 years. As a matter of fact, hams were among the pioneers in television, both color and black and white. Unfortunately, except for a few isolated pockets of activity, ATV has never really caught on.

Two major reasons for this come to mind. First, there seems to be a fear of television by amateurs, both in terms of cost and knowledge. Most of the hams I talk to think that ATV is going to cost a mint. In further columns I will describe how to cut corners in assembling an amateur television station. As far as knowledge goes, television really isn't hard to understand if you take it a little at a time and use the right sources of information. Probably the best book that I have seen so far is Photofact's *Television Course (No. 20595)*. It doesn't use large words or fancy terms that take an engineering degree to understand.

The other major reason ATV isn't too popular seems to be because of the bandwidth (6 MHz or more). ATV is limited to the 420 MHz band and above, with inherently shorter range. In addition to this, at least in the Washington DC area, there are a lot of tall buildings, which tend to limit the range even more. As if that weren't enough, quite a few of the ATV enthusiasts live in apartments, and as a consequence of this ATV here has started up and died several times.

An idea that we have come up with to combat this is an ATV repeater. It's in and out frequencies are 439.25 MHz and 427.25 MHz respectively. These frequencies are already set aside for ATV in our area. The machine itself is already installed and operable. As usual the holdup is with the FCC. The repeater application itself has already been approved, but we have to file a special request for a waiver because of the frequencies involved. It seems, for some obscure reason, repeaters are allowed only in the 442-450 MHz section of our 420-450 MHz band. This portion of the band is already being used for FM repeaters, FM simplex channels and control links. In addition, since we are talking about television, the total bandwidth involved is about 12-16 MHz. It's kind of hard to put this in an 8 MHz slot.

The repeater is being supported by a new club called Metrovision. It was formed last September by a group of hams trying to establish ATV here in the Washington area. In addition to keeping the repeater operating Metrovision is also helping local hams find equipment and helping them to get it working after it has been found. We are also giving talks to area radio clubs. Since we are a new group we cannot handle many requests from outside the DC area, so what I hope to do is answer many of these questions in this column.

Each month I will describe parts of the repeater, some of the easiest ways to get on ATV, station accessories, and discuss ideas and comments sent in to me by others. Hopefully, when we show how simple it is to get on ATV more hams will discover this exciting mode.

An ATV repeater is a little mind-boggling when you stop and think about it. Instead of trying to describe your latest home project or addition to the family you just set up the camera and show it to your friends. Community projects are limitless, from televising local parades to hospital patients, to visual coverage of area wide disasters with mobiles and portables. Instead of having to hear someone else's report on the usual traffic jam during rush hour you can *see* exactly what it looks like. How about when Bell Telephone has their *Picture-Phone* available inexpensively, being able to see into your home from your car via the repeater's videopatch. Another idea that comes to mind is to link several repeaters together via microwaves so that someone can actually see whomever he is talking to in another city many miles away. The possibilites are limited only by ones imagination (and maybe the FCC). It is interesting to note that, according to reliable sources, the FCC cannot monitor ATV because they cannot afford to get the necessary video equipment!

In case you're questioning the above, mobiles and portables are possible. In fact, the repeater isn't even on yet and we already have two mobile ATV stations capable of going on the air! One is Mike WB4DVD and the other is me. Incidentally, many thanks to Bruce WB4YTU, the Metrovision station trustee, who has done most of the work on the repeater.

As you can see there are many possible uses for ATV, and it isn't as hard as it sounds to get on. There are quite a few topics that can be discussed in future columns, but the most important topics are the ones that you want to hear about. So, please write and tell me what you want to see. Also, I'm looking for good ideas and tips to pass on to readers.

Until next time, BCNU on 439 ATV.

FLASH!

On January 25, our repeater license arrived from the FCC with a six month waiver to use 439.25/427.25 MHz as our input and output frequencies. Our call is WR4AAG.

WB4JPI

W2NSD continued from page 3.

regulations affecting amateur radio should be gotten to the amateur magazines. Ways in which amateurs can help situations should be gotten to clubs and club councils via newsletters. Tape cassettes for club programs could fill amateurs in on what is happening and how they can help. These could be played over the air via repeaters and by official news stations. In this way the response of amateurs to threatening legislation could be organized and better use made of Congressional pressure.

And what would such a Utopian setup cost us? About $100,000 per year would do a fine job, and that would include everything. That's less than 50¢ per licensed amateur per year. Is there any amateur who would not put up that much to keep the hobby healthy?

220 MHz?

No word yet from the Commission on 220. There has been some talk, in view of the stiff fight put up by the amateurs, particularly through Congress, of going the Hobby Band route. Boy, oh boy, do we need a lobby in Washington! So much of the decisions on these things is involved with politics rather than reason.

A lobby in Washington would make mince meat out of these attempts to slice up our bands and take them away. They would not only keep their finger on the pulse of the FCC, finding out where the pressures are that are zinging us, but they would be in touch with Congress and they would let amateurs know, via the ham magazines, where they could help.

73 MAGAZINE READERS CAN SAVE $200,000,000 IN TAXES

The readers of 73 Magazine will pay in about $200,000,000 in estate taxes at the current rate of taxation. It is very patriotic to support your government and all that, but as far as I can see every dollar of that can be saved

for your family. The chances are that they might be able to make better use of it, if you've taught them anything.

The old saying that there are two things you can't avoid — death and taxes — may not really hold water. And that goes particularly for death taxes. Unfortunately I don't have any hot information on how to avoid death indefinitely, but there are some ways of avoiding taxes. Legally.

One of the best books on the subject is published by the National Council to Eliminate Death Taxes Inc., Rts 2, Bovey MN 55709, and costs $9.95. This book explains the whole situation in detail and guides you through most possible contingencies. While the book does not eliminate a lawyer from the deal, it does explain how to locate the type of lawyer you really need, how to bargain with him, what the service should cost, and it takes the mystery out of the whole business.

The book not only covers dealing with the IRS, but also with your state laws. The laws of every state are in there, along with instructions on how to cope with them. That could save your family another bundle, over and above the IRS savings. . .unless you want the IRS and the state to make out like bandits when you leave us. That could add another $50,000,000 to the $200,000,000 above.

NEED TAX HELP? CUT YOUR THROAT

Two letters arrived in the same mail recently, one from the IRS with the below ad and the other, a confidential one, from a reader who had been innocent enough to use the IRS tax advisory service.

I hesitate to give the details of the reader case because I don't think you'll believe me. You'll think that this one Wayne Green made up because it just isn't possible. Well, here's the story, sent in by a ham that I've known for many years.

This chap, who had a small radio business, went to the local IRS office and the agent there helped him make out his tax papers. There was one item which was questionable as a deduction. . .the tax would have been about $12 on it. . .the agent decided that it was indeed deductable. The papers were sent in and the tax as calculated by the agent was paid.

About seven months later two agents walked into his store and said that he owed the $12 plus interest plus a $50 fine for not listing the item as taxable. He went with the two agents to the local IRS office and found the agent who had made out the return. This agent remembered the item and told the other two agents that if the item was not going to be accepted as deductable that no fine should be imposed and only the $12 charged, plus interest.

The agents said they would get in touch with Washington and get back. A couple of days later they came back with the news that the $12 plus interest was due immediately, plus the $50 fine. . .and if it wasn't paid in two days there would be another $50 fine added to it. He paid the $12, plus 48¢ interest, plus $50 fine, and thought he had a good idea of where Hitler's associates had gone when they bombed out in Berlin.

"GETTING" THE MAFIA

The IRS was set loose on organized crime when law enforcement authorities found themselves helpless to cope with it. The IRS has racked up an impressive history of "getting" these people. Unfortunately, once you give an organization the power it needs to tackle something as big as organized crime, how do you stop it from using this mighty weapon on average taxpayers? Unfortunately the answer is that you don't stop them and the same illegal methods of investigation and prosecution are being used today to trample small business and the little man.

Many of the 73 readers work in electronics industries, including those which specialize in surveillance and secret communications. These readers report that the IRS is a leader in buying sophisticated secret equipment of the very latest type and that cost is no object. How many Mafia chiefs have they put away recently? They don't seem to bother these fellows much now that they have high priced lawyers and accountants to protect themselves. This has meant that the IRS agents have had to turn to the small businessman to keep his quota of collections high enough to be promoted. Where there is a demand for collections, you can be sure that no agent is going to fight tough opponents when there are saps to be hit instead.

IRS TERRORISM

In an article in the American Mercury Dorothy Gordon tells of the nightmare of her dealings with the IRS. She reports that the IRS decided, with no proof offered, that her husband owed extra income taxes. Agents suddenly appeared at their home and attempted to seize a car (which did not belong to Gordon). Gordon then got in the car and drove it away, forcing the agents to move their car which blocked the driveway.

The agents then backed up a tow truck and towed away a '59 Ford belonging to Gordon's son. They told Mrs. Gordon that they were Federal Marshals, but later it turned out that they were merely IRS agents. When she demanded that they leave they threatened her with arrest. Her daughter tried to get her school books out of the car as they were taking it away and they threatened to arrest her—she never got her books or clothes from the back seat.

One of the agents told Mrs. Gordon that the IRS was out to "get" her husband and would use any means and would take everything they owned. They charged him with assault with a dangerous weapon (the car with which he forced the agents to move out of the way was the dangerous weapon) and had him arrested. Gordon was enthusiastic about this for he thought he would then get a jury trial and have his chance to speak up. The court refused him a jury trial and, when he insisted through three pre-trial hearings, they decided to commit him to a mental hospital.

need tax help?

Call IRS toll free

No matter where you live, you can call the IRS toll free for tax assistance. To find the toll-free IRS number for your area, check your tax instructions booklet or your local telephone directory.

Department of the Treasury
Internal Revenue Service

When Gordon got *word* that the plans were to put him away and that six tough agents were scheduled to beat him on the way to the mental institution, he escaped to Canada, where he is now living in exile.

This happened in Massachusetts.

KICK A CRIPPLE

In Nevada a woman was living with a fellow, but not married. One day this chap had the misfortune to get caught with a big bundle of pot. The IRS has a tax on pot, even though it is not legal to sell the stuff. The IRS then claimed that the chap owed $500,000 in pot tax on the confiscated pot. The fellow had one more misfortune – he and his girl had a car accident which killed him and put her in a wheelchair for life. The woman didn't have much except a small home, but she figured that she would be able to sell it and invest in a small business that she could run from her wheelchair. The IRS then claimed that she was the common law wife of the now deceased defendent and laid the $500,000 tax claim on her. They took her house and auctioned it off and left her with nothing to do but go on welfare for the rest of her life.

An ex-IRS agent, in an interview in Freedom Magazine, explained how he could get anything he wanted from banks as an IRS agent with his pocket subpoenas which he carried with him. He would fill one out on the spot to examine any bank records or go into safety deposit boxes. They would even have to drill open the boxes for him!

The ex-agent explained how the IRS is often used to "get" people whom politicains want to harass. The word would always come down verbally, nothing written, and the agent was told to stay with the case until something was found. He went on to say that there isn't a return in the world that an agent can't find something wrong or even change to trip up a taxpayer.

The ex-agent also said that the IRS will assign special agents to pose as regular agents when they are trying to build up a case of fraud so that the taxpayer has no idea he is being investigated for fraud.

Knowing that the large corporations can put up a fight, and that it is worth their while to fight, the IRS goes after small business and the little guys who have no such legal protection. Big business also has the political clout to keep the IRS agents away.

Senator Cotton (NH) said, "My files, like those of overy other Senator, are filled with moving appeals from taxpayers whose experiences with the IRS have turned into nightmares of inquisition."

IMMEDIATE CHANGE

One serious defect in the present system of "justice" for IRS persecuted little people is the secret grand jury system where the whole proceedings are carried on behind closed doors and no records whatever are kept. This was set up to protect witnesses against organized crime repraisal, and it is good for that purpose, but is it reasonable to use this same system against ordinary taxpayers?

At the very, very least there should be some arrangement for an attorney for the accused to have a chance to answer questions that the grand jurors might have. As it is now an IRS agent can go before a grand jury and say absolutely anything he wants, knowing that there is no record kept and thus he is totally unaccountable to anyone. Since he is the one who wants an indictment, there is nothing to prevent him from perjuring himself to almost any length except his own conscience. On the other hand there is the pressure from the higher ups in the IRS to get a conviction.

What could it possibly hurt in nonorganized crime cases to permit the grand jury to ask the defense counsel questions? Even if the defense counsel had no way of knowing what the agent had testified, this certainly would be helpful to the grand jury in performing their function. The present system where the defense is not present at any time, and cannot be consulted, is extremely unfair.

Why can't the defense be present? Well, the idea is to keep back as much of the case as possible until the actual trial so as to prevent the defending lawyer from being able to prepare a defense. This is very important in tax cases where almost unknown regulations are involved which would take long periods of time to look up. There is no intention of having a fair trial which will try and find out whether the defendent actually did do anything illegal, only a test of lawyers trying to outwit lawyers, paid for by the government on one side and the poor taxpayer on the other.

JORDAN TOUR POSTPONED

Due to the continued tensions in the mideast, it seems prudent to put off the planned ham tour of Jordan. Once things have settled down a bit and Kissinger is back stateside for awhile, such a trip might be a little more fun.

GET WAYNE GREEN?

Another reader, who prefers to remain anonymous, advises that a friend of his in the FCC Washington office has informed him that someone there is doing his best to make problems for me. He says that the staff has been asked to look carefully into my "portable one" call and the validity of its use. Well, that isn't really a surprise since Walker threatened me with that over a year ago.

97.43 says that every amateur station shall have a fixed transmitter location. The fact is that I do have such a location and it is in Brooklyn, New York. . .and has been since my family moved there in 1909 from Denver. It would be difficult to find a more fixed location for me. Oh, I've lived for a while here and there, renting a room or even an apartment for a bit. I tried changing my ham license as I moved around for a while, but the FCC was always at least one move behind me. I just barely got my W4NSD call when I was back in Brooklyn and active as W4NSD/2. Then I went to work in Ohio for a while and operated as W2NSD/8 while the machinery at the FCC creaked along. . .I remember operating the first weekend of the Sweepstakes Contest as W2NSD/8 and racking up a great score. The next weekend I had my new call, but I was back in Brooklyn and I operated in the second weekend of the contest as W8NSD/2!

Then it was Florida and W4NSD again. . .then W4NSD/2 back in Brooklyn. I didn't even try when I was W2NSD/5 for a summer. . .for I could see that the only really permanent location I had was in two land. Besides, the FCC decided to stop giving counterpart calls. . .they couldn't be bothered any more with this.

Message to Walker: If you can't justify the rules you've been jamming down our throats, are you going to try and shut up the *only* editor who has the guts to speak out?

97.97 gives us the rules for portable operation and I have filed my notice of portable operation as specified in the regulations. The fact is that after being NSD for some 35 years I do like it and would prefer to stay that way if it is possible. . .and the rules seem to make it legal. Of course if Walker would act on RM-1455, which was filed back in mid-1969, almost five years ago, then we might be back with counterpart calls again and W1NSD would be available. That's probably what will happen just about the time I return to Brooklyn.

EMERGENCY PREPARATIONS

It is not enough to have your repeater set up for autopatch for reporting accidents to the gendarmerie. With any real bad luck you'll need something more elaborate to meet the situation.

If your repeater group is going to be able to cope with something substantial in emergencies, you'll need both direction and experience. Too bad if you wait for the disaster to try and develop these basics. Perhaps, at the next meeting, an emergency coordinator could be appointed or elected. This person would have the responsibility of arranging for the group to be ready for the biggie, when it comes.

The EC should get his notebook set up with the phone numbers of all club members, with a list of the equipment they have which might be of value such as spare rigs, mobile setups, hand units, power generators, things like that. He'll want to have the numbers of other local radio services and groups . . . radio and TV stations . . . police . . . fire . . . ambulance . . . forestry . . . road agents . . . public service . . . anyone or group you might need to contact in emergencies . . . hospitals . . . doctors . . . garages . . . as well as a contact with each of the other two-way radio communications services in the area . . . doctors . . . sheriffs . . .

The EC can get together with police or the fire department and set up an exercise to provide training for the group. In this way a minor emergency can be used as practice. Some groups use parades, rallies, and things like that to get experience in getting out the troops and getting everyone used to working together.

Your own imagination can take it from there.

STATION VS. OPERATOR LICENSES

There is a tendency in dealing with problems. . .and most problems stem from people. . .to try and dehumanize the situation and deal with it that way. When we get interference on the air there is a tendency to think of it as being a sideband station – an RTTY station – and on FM there are base stations, mobiles, and the like. "Let's keep the base stations off the repeater," you'll hear some voices cry.

The time is not long past when the FCC reinforced this concept with the license. It was the location that was licensed with call letters, not the operator. The operator license was separate and had no call letters on it. The FCC followed this further by insisting that no operator use the call letters of the station being used.

Recently the Commission has turned this around. We have one license now and it serves as both a station and operator license and the concept of the operator having the call rather than the location has been accepted. Now, when you use another station you normally are supposed to use your own call.

Perhaps it will help us to deal with difficulties on the air if we keep in mind that those are all people out there – each one an individual – each with his or her own interests and goals – each worthy of knowing (with a few exceptions). Is a person of less interest to talk with if he is sitting at home than if he is in his car? In fact it is generally the other way around, for the mobile operator has a good part of his attention on his driving and the chances of anything much more than total trivia emerging from the contact is miniscule. At least the home operator (called a base station operator by 10-4 adherents) can devote his entire attention to talking with you.

Admittedly the mere fact that communication is possible is worthy of note, but is this any reason to devote such a large portion of the use of the amateur bands to this topic? On the low bands an inordinate proportion of the average contact is spent commenting on the signal strength, the equipment used, and other things having to do with the mechnaical aspect of making the contact. How much time is devoted to the human being at the other end? How much time is spent using this marvelous electronic invention for a way to communicate thoughts? The same observation holds for repeaters.

450 MHz UNDER FIRE

Backed by exciting television shows, the emergency medical services are making a play for more UHF spectrum (Docket 19880) and one of the things they want is the top two MHz of the 450 amateur band. Just to make it binding they have initially asked for three channels in this band for immediate allocation.

220 MHz, which had not yet become much used, was one thing – the 450 band, which is full to bursting in many areas of the country, is something else. To my mind every kHz is precious and should be zealously guarded. Before FM became popular on two meters the 146-148 MHz segment of the band was virtually unused and one ham magazine was seriously talking about opening that as a CB band – and the industry was listening. FM came along just in time to make that idea unpopular. We can't go along living as if there is no tomorrow.

If crossband is permitted for repeaters we will see a great need for 220 MHz channels and the 450 frequencies will be used up everywhere. Even 1250 MHz will soon come into popularity.

Some recent developments in narrow band television show fantastic promise for that mode and we may soon see repeaters for this mode starting to proliferate. It now appears as if a television signal of good quality may be compressed to 100 kHz, which is a good start, and certainly practical for repeater use. We could get 100 of those channels between 420-430 MHz!

And those are only the things that we can see coming. We should leave some room for things that are not yet obvious.

BUYING CASSETTES

The 73 Magazine code cassettes have been incredibly popular, and that has produced problems, naturally. One of the weird ones has to do with getting blank tape cassettes. There shouldn't be any problem with that, right?

First we wrote to every known manufacturer of cassettes asking for prices. About 20% of them bothered to answer. A few did send prices, and a couple even sent a salesman. The next step was to try and get the best price we could, and there is where frustration really set in. Would you believe that we found that we could go down to a discount store in Peterborough, New Hampshire and buy cassettes cheaper over the counter than we could in 1000 lots from the manufacturer? Fact. And you should see the eyes pop when we walk up to the counter and ask for 1000 cassettes! And you would die laughing as the checkout girl dutifully rings up each cassette individually, resulting in a tape yards long. Weird.

HOT NEWS FOR RTTYers

Owners of RTTY machines are missing a lot of the fun of owning such a contraption if they don't tune it in for the latest news dispatches now and then. Some of the news channels are difficult to find in amongst all of the other debris that clutters up the short wave bands, but you might try some of the following and see how you make out. Most of them use the standard 425-850 Hz shift and 60 wpm speed.

8PX29 Barbados	6910 kHz
WFI29 New York	9327.5 kHz
WFK80 New York	10753.5 kHz
WFL71 New York	11641.5 kHz
WER73 New York	13480 kHz
WER24 New York	14770 kHz
WFM75 New York	15706 kHz
WEY45 New York	15914 kHz
WFK48 New York	18542.5 kHz
WER78 New York	1885.0 kHz

A much more comprehensive list of commercial RTTY stations as well as a whole raft of other confidential frequencies is available from Gilfer Associates Inc., Box 239, Park Ridge NJ 07656. The book is the "Confidential Frequency List" and it is $3.95.

Caveat Emptor?

Price – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

DAYTON HAMVENTION expands to three days April 26, 27, 28, 1974 at HARA ARENA and Exhibition Center. Brochures mailed March 15th. Write for information if you have not attended the last two years. P.O. Box 44, Dayton, Ohio 45401.

SWAN CYGNET-260, SSB built in AC/DC, excellent condition., Factory overhaul $275. Regency HR-2A, 15W. FM with 52/52, 94/94, 04/64 installed, factory carton, mint condition $160. K4HHH/6, P. O. Box 81652, San Diego CA 92138.

PRINTED CIRCUIT TECHNIQUES FOR THE HOBBYIST. Ferric chloride "suspension etching," cutting epoxy glass, screen printing, etc . . .BOOKLET $2. TRUMBULL' 833 Balra Dr., El Cerrito CA 94530.

THE TRI-STATE ARS WILL hold their annual hamfest on May 18, 1974, at the 4-H fairgrounds, U.S. 41, three miles north of town. Overnight camping, auction, flea market, door prizes and ladies bingo. For information or advance registration contact: Steve WB9MDB, 5805 Berry Lane, Evansville IN 47710.

GOOD NEWS – The SRRC Hamfest June 2, 1974 at fabulous new site in Princeton, Illinois Fairgrounds. SRRC/W9MKS, RFD No.1, Box 171, Oglesby, Illinois 61348.

WANTED – Technical manual for R-278B/GR military receiver. WB5AYZ, 1013 Indiana St. SE., Albuquerque NM 87108.

FM: TOUCH-TONE PADS, 12 button – $13.99 plus 50¢ postage. New Regency HR-212, w/AC supply $269.95; HR-2B, w/AC supply $239.95. Tempo, Gladding, Cush Craft, etc. Call or write for lowest prices anywhere. Used Gladding 25, w/AC supply – like new $189. Ramcomm Communications, 2383 West Side Drive, North Chili NY 14514 716-594-8114.

EQUIPMENT FROM 73

The following list of gear, unless otherwise noted, consists of brand new equipment purchased for testing purposes only. Some have been tested, some remain unopened in original cartons. We are offering this gear at a considerable discount on a first-come-first-served basis. Please send Money Orders or Certified Checks only to 73 Magazine, Peterborough NH 03458.

Cap Com 40M solid state SSB xcvr	$150.00
Gladding 12V power supply	$60.00
SBE Scanavision	$650.00
Midland 13509 220 xcvr	$200.00
Tempo CL-220 220 xcvr	$200.00
Clegg FM-21 220 scvr	$255.00
TME-H-LMU 16 channel rcvr	$255.00
Digital logic-clocks	$80.00
Wilson 7 element 10 and 15M beam pick up only	$250.00
Waller 60A power supply	$105.00
Pickerina KB-1 keyobara	$200.00
Heath HWA-202-1	$30.00
Heath HA-2022 amplifier	$70.00
Gladding HI Scan	$150.00
Regency TMR-8-U Scanner	$140.00
Tempo fmh charger	$25.00
GTX-2 FM rcvr	$225.00
Newsome 2M KW amplifier	$350.00
Heath IC-2009 calculator	$90.00
SBE 450 FM xcvr	$340.00
Mits 908M w/ac and case	$130.00
Memory Matic 8000	$320.00
IC-30	$350.00
IC-60	$300.00
AX 190 amateur xcvr	$200.00
Pickering KB-1 keyboard	$200.00
SBE-450 FM xcvr	$340.00
GYX-200 (slightly modified)	$200.00
Heath 1B-101 counter with Vanguard scaler	$250.00
Standard SRC-120/5 power supply	$44.00

DIGITAL frequency display for your receiver and transmitter. Also works as conventional counter. Detailed plans $3. Communications Electronics Specialties, 814 Orwell Ave., Orlando FL 32809.

FAX PAPER: For Desk-Fax, new (not surplus), precut (not rolls), $15 per thousand sheets, postpaid worldwide. Bill Johnston, 1808 Pomona, Las Cruces, New Mexico 88001.

MOULTRIE AMATEUR RADIO KLUB, 13th Annual Hamfest, Wyman Park, Sullivan IL, April 28, 1974. Indoor – Outdoor market. Ticket donation $1 in advance – $1.50 at the door. For information write: M.A.R.K. Inc., P. O. Box 327, Mattoon IL 61938.

WANTED – MANUALS ON FRR-33, CU-286/FRR-33, ARC-96, TT-513/FR, R390A operator's manual. Xerox copies OK. Call 603-673-1948 collect.

FREE: 18 CRYSTALS of your choice with the purchase of a new Genave GTX-200 at $269.95. Send cashier's check or money order for same-day shipment. For equally good deals on Drake, Swan, Standard, Clegg, Regency, Hallicrafters, Tempo, Kenwood, Midland, Ten-Tec, Galaxy, Hy-Gain, Cush Craft, Mosley, Sony and Hustler, write to Hoosier Electronics, your ham headquarters in the heart of the Midwest. Become one of our many happy and satisfied customers. Write or call today for our low quote and try our individual, personal service. Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. 812-894-2397.

BUY-SELL-TRADE. Write for monthly mailer. Give name, address, call letters. Complete stock of major brands, new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc., SSB & FM. Associated Radio, 8012 Conser, Overland Park, Kansas 66204. 913-381-5901

CASSETTE TAPES wanted, any quantity, any quality, new or used, as long as they are in good working order and a bargain. Write Box BM, c/o 73 Magazine, Peterborough NH 03458.

CALCULATOR OWNERS: Use your +-x÷ calculator to compute square roots, cube roots, sin(x), cos(x), tan(x), arcsin(x), arccos(x), arctan(x), logarithms, exponentials and more! Quickly, accurately, easily! Send today for the IMPROVED AND EXPANDED EDITION of the First and Best Calculator Manual – now in use throughout the world. . .only $2.00. Unconditional moneyback guarantee – and FAST service! Mallmann Optics and Electronics, Dept. - E3 836 South 113, West Allis WI 53214.

GREATEST of them all! That's the ARRL 1974 National Convention, sponsored by Hudson Amateur Radio Council. Remember the dates – July 19, 20, 21 at the Waldorf-Astoria, New York City. Three days of exciting events!! Wide array of demonstrations, exhibits and forums featuring latest in FM, SSTV, ATV, RTTY, FAX, Satellites, Antenna design, Transistors, Integrated Circuits, DX, MARS, ARPSC and much more. Something to do every exciting minute for YLs & XYLs – Tours, New York sightseeing, visits to popular TV shows, Parties, Fashion Shows. Meet the ARRL President, Vice-presidents, and all 16 Directors! Famous-name Speakers at Saturday Night Banquet! Everything for the Non-Ham, New Ham and Old Timer. For Info, Contact: ARRL Convention, 303 Tenafly Road, Englewood, N.J. 07631.

WANTED: Popular Electronics issue on VLF transmitter NPG, Jim Creed, Washington. Early Sixties. H. A. Weber, 2605 West 82nd Place, Chicago IL 60652.

CURTIS ELECTRODEVICES and Madison Electronics present the finest in CW devices: EK420A CMOS Deluxe Keyer $139.95; KM410 CW Message Memory $299.95; KB4200 Keyboard Morse Generator $499.95; Write Literature. Brown and Vibroplex Paddles; UPS Collect. Madison Electronics, 1508 McKinney, Houston TX 77002. 713-224-2668; Nite – 713-497-5683.

VERY INTERESTING! Next 5 isues $1. "The Ham Trader", Sycamore, IL 60178. (Ask about our "HAM EQUIPMENT BUYERS GUIDE" covering Receivers, Transmitters, Transceivers, Amplifiers 1945–74. Indispensable!)

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding. Literature. Estes Engineering, 543-A West 184th St., Gardena CA 90248.

FOR SALE: Drake 2NT transmitter, Heathkit VFO, one year old, perfect condition $140. Richard Newman, 2 Clinton St.. Milford CT 06460 203-877-2205.

WANTED – UG-970/U Twin-UHF adapters for R-390A/URR; other surplus RF connectors. Best prices paid. Send details to Hampstead, P. O. Box 185, Milford NH 03055.

FOR SALE – AN/FRR-33 (SRR-13) 2-32 MHz receiver in good condition with book, $85, freight prepaid in U.S., John Sullivan, Box 185, Milford NH 03055.

FOR SALE – PAIR AN/PRC-25 portable FM transceivers, 30-74 MHz synthesized, like new with antennas, book, handsets and 1 AM-2060A/GRC audio amplifier/speaker/power supply/mounting base for mobile use, $300 takes all, UPS prepaid in U.S. 603-673-1948 collect.

FOR SALE: 432 HANDIE TALKIE SR-C 432 2 watt 6 channel with case $270. 2m Handie Talkie SR-C 145B 2 watt 5 channel with case all new $230.. Joe Gibson, P. O. Box 442, Wallingford CN 06492.

MOTOROLA PORTABLES – Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal Services, 6663 Industrial Loop, Greendale WI 53129.

G.E.MASTROWNERS, add five channels the easy way! Drilled board and instructions $4.50. SASE for information to J. Jones, 1310 West 29th St., Lorain OH 44052.

FM RECEIVERS' R-257/U, 25-55 MHz crystal controlled, some need repairs. Schematics included while they last. These were $14.95 plus shipping; NOW ONLY $8.95, 2 for $15, shipped PREPAID 48 states. Other items, especially RTTY and FAX. SASE for free list. Jim Cooper W2BVE, P. O. Box 73-G, Paramus NJ 07652.

LOOKING FOR DESK STAND for W.E. 600A double button carbon broadcasting type professional mike. . .Jean Shepherd K2ORS, WOR, NYC 10018.

WANTED SCHEMATIC for DAVCO DR-30 Receiver, Hughs MIM-Scope, Borrow or buy, first class postage both ways. WB4TDE/4, 516 E. Carroll ST., Tullahoma TN 37388 615-455-2815.

73, COMPLETE run for sale; want same, Ham Radio. K8JLK.

CABINETS 19" new Emcor – 72" rack space with rails and plugstrip, $70, delivered in Central and Western New York. N. Litsche, Rt. 1, Hemlock NY 14466.

COLLINS KWM-1 with ac, dc, speaker console, and mobile mount, very good condition $350. Hallicrafters HT41 linear $135, Collins 75AZ with product detector $150, Heath HW16 $75, Heath HX20 $125, Swan 240 with ac and TCU $250. Jack Osborne K6LVD. 5636 Del Monte CT. Canta Rosa CA 95405.

NORTH FLORIDA SWAPFEST March 31, 1974, Community Center, Highway 98. Write: PARC Box 873, Fort Walton Beach FL 32548.

KLM AND MADISON ELECTRONICS present the finest in VHF Antennas. 144-148 MHz, 7-element to 16-element; 9-element $31.95; 14-element $45.95; 16-element $49.95; 220 MHz; 420-450 MHz, 14-element $19.95; 27-element $41.95; Write for literature. UPS Collect. Madison Electronics, 1508 McKinney, Houston TX 77002. 713-224-2668; Nite – 713-497-5683.

CE-100V MINT w/original crate $250, or trade MN-2000, T4X-B, DR-30, DT-20. Need dow keys, coax switches, rotary inductors. WA2FQH, 89-38 188 St., Hollis NY 11423. 212-454-1369.

WANTED – TT-63 Regenerative Repeater or AN/FGC-7 repeater set. Call 603-673-1948 collect.

FOR SALE: DRAKE R4B, T4XB, AC4, matching speaker. Excellent condition, little use, one owner, $750. TEMO I with ac/dc $400. Halicrafters HA-1 TO keyer $50. Galaxy 300 3-band SSB transceiver with ac $125. Phil Sager WB4FDT/5, St. Mary's University, Chaminade Hall, Box 86, San Antonio TX 78284.

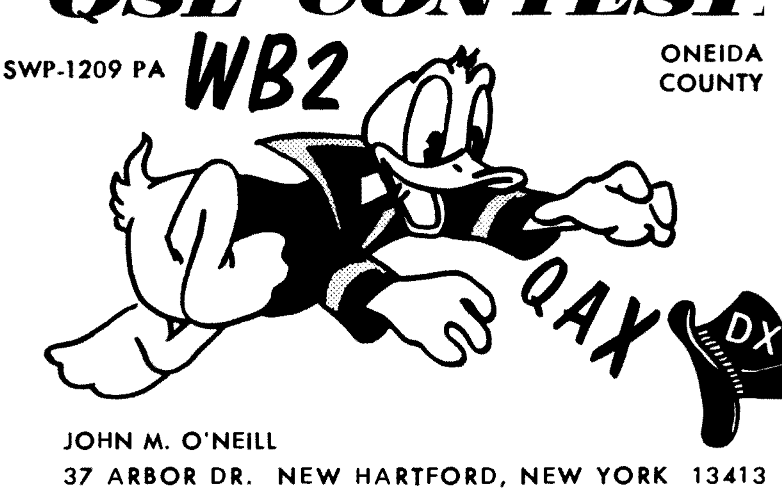
HALLICRAFTERS FPM-300 MKII includes fan, all crystals, extra final, perfect condition. Must sell $565 firm, postpaid. Charles Signer DA1SI, Box 775, APO NY 09742.

WANTED 51S1, serial above #500, excellent condition with manual, boxed, delivered to airline. State serial and condition. Arthur S. Cohen, Risco No. 437, Mexico 20., D.F. Mexico XE1LL.

19TH ANNUAL HAMFEST & Auction to be held Saturday March 9, 1974, at the Lucas County Recreation Center, 290 Key St., Maumee OH. Registration $1.50 in advance, $2 at the door. For further information and map write: Toledo Mobile Radio Association, P. O. Box 273, Toledo OH 43695.

WANT TO BUY SW broadcast receiver, Drake SW-4 or similar, David Potter, 406 E. 32, Austin TX 78705.

QSL CONTEST



Our winner this month is John M. O'Neill of New Hartford NY. Mr. O'Neill apparently found out about one of the judge's deepest and darkest secrets in life, an unabashed fanship for Donald Duck. He then took this knowledge and power and had his QSL card made up to exploit this emotional feeling of the judge's. Are there any limits to what a person will do to win a 1-year subscription to 73? Very sneaky Mr. O'Neill.

You might be as lucky as Mr. O'Neill, enter your QSL card in our contest. Send all entries to 73 Magazine, Peterborough NH 03458.

SOCIAL EVENTS

LANCASTER FEST

The second annual Eastern PA hamfest and flea market will be held at the Naval Reserve Center in Lancaster PA from 10 AM to 4 PM, March 1974. For further information write Al K4AVQ/3, 20 Lepore Drive, Lancaster PA 17602.

CENTRAL MASS AUCTION

The Central Massachusetts Amateur Radio Associations annual auction is April 20, at the Knights of Columbus Hall, Rt. 9, Spencer MA, beginning at 1:00 PM Talk-in on .94 and 37/97. For further information write: WA1FIH/1, 1622 Worcester Rd., Apt. 421B, Framingham MA 01701.

MOULTRIE KLUB

The Moultrie Amateur Radio Klub will hold its 13th Annual Hamfest April 28, 1974 in Wyman Park, Sullivan IL. Indoor – Outdoor Market. Ticket donation $1 in advance – $1.50 at the door. For information write M.A.R.K. Inc., P. O. Box 327, Mattoon IL 61938.

MIDLAND CANCELLATION

Because of the energy shortage the Midland Amateur Radio Club, has voted not to have the Swapfest this year. It was originally scheduled to be held March 23-24.

SEE YOU IN DES MOINES

The Des Moines Radio Amateur Association invites you to participate in the Des Moines Hawkeye Hamfest at the Iowa State Fairgrounds in Des Moines, Sunday, June 16, 1974, 8:00 AM to 6:00 PM CDT. Booths available for rental. For further information contact: Alan V. Harris, KØOOD, P.O. Box 88, Des Moines IA 50301.

CANTON – CAN DO

The Canton Amateur Radio Club will hold it's annual Auction & Flea Market Friday March 8, 1974, at the Imperial House Motel in Canton OH. Doors open for set-up 5:00 PM, begins 7:30 PM. Mobile check-ins on 147.06, .94 simplex and 19/79. Grand prize, mobile check-in prize, other prizes awarded each half-hour. Free coffee and donuts. Free set-up displays and exhibitions with free space. Imperial House Motel is located just North of Canton OH on I-77. Take the Everhard Rd. exit West just .2 miles. For exhibit and display reservations or additional information contact Mark Schontz WB8NUA, 601 Perry Dr., N.W., Canton, OH.

ROCKY ARRL FEST

The 1974 ARRL Rocky Mountain Regional Convention will be held June 7, 8, and and 9, at the Ramada Inn in Pueblo CO. Pre-registration fee is $6, at the door $7. Meals, accomodations and camper/trailer hook-ups will be available for the three days of the convention at special reduced rates. Sunday afternoon banquet with speakers from Industry and the Amateur Radio Field. For additional information write: Convention Committee, P. O. Box 92, Pueblo CO 81002.

BARRACKS FEST & AUCTION

The Jefferson Barracks Amateur Radio Club will hold their annual Hamfest and Auction at the Mosley Auditorium, 4610 North Lindbergh, St. Louis MO, on Friday, March 1, 1974. For further information contack: Gene Bell KØBVM, 375 CCC Road, St. Louis 25 MO.

IRVINGTON HAMFEST

The Irvington Radio Amateur Club will hold it's annual hamfest on Sunday May 19, 1974, 1-6 PM, at the Irvington PAL Building, 285 Union Ave., Irvington NJ. Admission – 50¢ in advance, $1 at the door. Table rental – $2.50. Refreshments will be available. Door prize!! For more information and advance tickets contact WA2PWZ, 9 Barbara St., Newark NJ 07105.

BLOSSOMLAND SPRING-THING

The Blossomland Amateur Radio Association will hold its Spring-Thing '74 Swap-shop and Auction on March 16, from 9-5 (set-up 7:30-9), at St. Joseph (MI) High School. Tickets are $1 in advance, $1.50 at the door. Talk-in, 22/82, .94 simplex. For more information contact: P. O. Box 175, St. Joseph MI 49085.

TRI-STATE ARS FEAST

The Tri-State ARS will hold their annual hamfest on May 18, 1974, at the 4-H fairground, U.S.41, three miles north of town. Overnight camping, auction, flea market, door prizes and ladies bingo. For information or advanced registration contact: Steve WB9MDB, 5805 Berry Lane, Evansville IN 47710.

MESILLA BEAN FEED

The Mesilla Valley Radio Club of Las Cruces, New Mexico, cordially invites you to its "Annual Bean Feed and Swap Meet," to be held April 28, 1974, at La Mesa Park. Prizes/Food/Beverages/Family Fun. Information on 16/76 and 3940 MHz. For more information contact Whitey W5ECQ.

HAMBOREE

The greater Baltimore Hamboree will be held at Calvert Hall College, Putty Hill and Goucher Boulevard, Towson MD (one mile south of Exit 28 on Beltway I-695), on Sunday, April 7, 1974, at 10 AM. Food service, flea market, prizes. Registration $2. No table or percentage charges. For more information contact: Joe Lochte, 5400 Roland Ave., Baltimore MD 21210, or Brother Gerald Malseed, 8102 La Salle Avenue, Towson MD 21204.

MAUMEE – HOW I LOVE YA

Our 19th annual hamfest and auction is to be held Saturday, March 9, 1974, at the Lucas County Recreation Center, 290 Key St., Maumee OH. Registration $1.50 in advance, $2 at the door. For further information and map write: Toledo Mobile Radio Association, Box 273, Toledo OH 43695.

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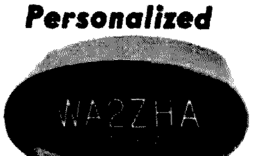

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LETTERS

VOX POOP

Dear Wayne: See that 3¢ stamp on the envelope this is sent in? Notice how great it worked? That give you any ideas for when they raise postal rates again?. . .K4IBB. *(Sonofagun, a 3¢ Francis Parkman stamp came through no strain!. . .wayne).* The Morse Code tape is terrific; I may have it learned in a few more days. The recorder itself is a great piece of engineering for the money – you must not have made the full markup. . .Wright. *(Yes, those recorders are excellent; I like the knob operation infinitely better than the key type of machines, particularly for car operation. . .wayne).* I was in your corner, Wayne, until you began your ridiculous attack on the FCC and Walker – get off your soap box. . . W8AUV. *(Perhaps AUV is right and I'm wrong – and the ARRL directors are wrong – and tens of thousands of FMers are wrong. . .wayne).* I like the variety of ads in the magazine; would like to see an article on high power rf transistorized linear amplifiers. . . VE3EFJ. Excellent magazine; more info on Amsat. . .Albanese. Would like more RTTY articles, more Motorola and GE FM conversion articles. I find the magazine easily readable, enjoyable, and informative. . .WB2BYQ. How about a longer W2NSD/1 column?. . .WA1IML. *(Good grief!. . . wayne).* Wayne, why don't you put out two magazines. . .one for 2m FM. . .then 73 can go back to being a general amateur radio magazine. . . WA8LTY. *(Any weight toward FM is caused by articles submitted, not by editorial slanting. . .so let's see more HF articles, more CW articles, more DX articles, more gadgets. . .wayne).* Generally well balanced. My primary interest is in IC's, digital and linear. Appreciate good articles like the one on LM-373 in April 1972, for instance. . .W8VDA. Would it be possible to get more DX news? Down here any info on DX is real news!. . . ZL1VD. Would like to see simple test equipment such as fet dip meter, fet voltmeter, dual trace generator for scope, general coverage receiver, ham band receivers, improvements of receivers, application of new IC devices. . .Evans. More 2m construction projects. . .WB4YXX. Walker stinks, QST stinks, CQ stinks, keep up the good work. . .WB5FWE. *(The IRS stinks too. . .wayne).* More articles on surplus 2m. . .KL7HRU. I like the pinup front covers and circuits-circuits. . .WB6FVW. Especially liked the November cover – have more on facsimile and 2m FM equipment reviews. . .WB2ELF. Your December cover is great!!! 73 has all the other magazines beat. . .WA3UES. Wasn't going to renew, but the December cover changed my mind. Bless you, you're right on, etc. . .WB4WBP.

10m AM EQUIPMENT NEEDED

Our club is in the process of organizing a Long Island High School Amateur Radio Club Net, and 10m AM equipment is drastically needed. Our own club station is borrowed equipment, and we have no assurance we will have it next week, so we need a station of any type. Any contributions are tax deductable (monitary *or* equipmentwise).

Our club is going to be operating all day on March 22, 1974, and we will offer a certificate to all those stations which QSL. We will operate 80-10m, phone-CW-Novice. We are presently seeking special temporary station authorization and are asking for WT2CHS.

W. Tresper Clarke High School
Amateur Radio Club
Westbury NY

CORPORATE MONOLITH STRIKES AGAIN

VHF Engineering sincerely appreciates the unsolicited letter from Bob Fox K2MDM, which appeared in your December 1973, issue. However, due to greatly increased order input and requests for literature etc., we have had to make a couple of policy changes. We can no longer repair and tune kits for free. The minimum charge is now $5 each. This normally covers anything short of a completely charred and destroyed unit. Due to our "Corporate Policy" of continually striving to improve our products we have been forced to discontinue automatic mailing of update information. The volume is simply to great for us to cope with. We do try to answer *all* legitimate inquiries quickly and keep all of our customers as happy and well informed as possible. We hope that these changes will not dissapoint anyone.

In answer to Mr. Fox's question concerning the possibility that we may consider manufacturing automobiles, I can only say that there has been no serious discussion of that subject here at VHF, YET! But, when it comes to communications equipment – we're #20 (or so) and we DO TRY HARDER.

Bob Brown W2EDN
Dave Agard K2TOS
Binghamton NY

YAY! – ADVERTISER

At a time when many businesses seem insensitive to the needs of their customers, I am happy to report that just the opposite is true of one of your advertisers, Columbia Electronic Sales of North Hollywood CA.

I recently mailed them an order for some ARC-5 surplus gear which I read about in an ad in 73. When the stuff arrived, one of the pieces was not what I had ordered, but rather something similar in outward appearance but completely different internally and practically useless to me.

I wrote to Columbia explaining what had happened and asked for a rectification of the mistake. Almost by return mail I received a reply from Mr. Paul Keys of Columbia, stating that the correct item was in the mail. He made no request that I return the incorrect item originally sent – as you know, postage on some of these things equals or exceeds their worth. Today I received the item originally ordered – exactly two weeks to the day from the time of the mailing of my original order. That's fast service. I might point out, also, that all this was done for a very small order. It's almost a certainty that Columbia lost money.

John Grahl WBØCAW/7
Pocatello ID

HE LIKES US

The free and easy style of your magazine is in sharp contrast to some other amateur periodicals which tend to be a little too formal and a bit stuffy. 73 makes for enjoyable reading and since this is still a free country (in spite of some recent FCC rulings) the readers can disagree with portions of the editorial comments without the possibility of facing a firing squad. I suppose editorials with which all readers agree would make for very dull reading. Keep blazing away – most of us like it.

Solid state projects appearing in 73 are particularly enjoyable to me. I have one suggestion which would simplify construction of many of these items. Where printed circuit boards are used a full sized layout diagram is much to be desired. These diagrams can be clipped out, fastened to the copper clad board, and holes drilled at the connection points. It is then a simple matter to complete the layout on the copper surface using resist material or for a neat job the tape donuts and strips are ideal. For instance, peel backing off one of the small donut pads, stick a pin through the hole. Then, use the pin to center the pad over the pre-drilled hole in the board. Line connections are then easily made using the tape strips. If a number of the same layouts are needed several layers of PC board can be taped together and drilled simultaneously or an aluminum template can be made.

W. E. Byron WB4PKR
Pensacola FL

SIGNAL/ONE

I have just read your editorial comments concerning Signal/One, Ed Jay, etc. Thought you might be interested in publishing the following concerning the new company (Signal/One, P.O. Box 127, Franklin Lakes NJ 07417).

The assets of Signal/One Corp., were purchased in the California courts and have since been moved to Franklin Lakes NJ, where the new CX7B is being developed and will be marketed in late spring of 1974. The new company is incorporated as Signal/One of New Jersey and headed by Don Roehrs WA2SAB, who is President and General Manager. All the stockholders are residents of the East Coast, including Don Payne K4ID, of Payne Radio, who will be the exclusive distributor of the new Signal/One products. The parts and service department is already open to owners of all CX7 radios.

There is absolutely no relationship or ownership by any of the defunct California Corporation stockholders or employees.

The new CX7B will be introduced at the Dayton Hamfest on April 27, and will include extensive engineering improvements.

Don Payne K4ID
Springfield TN

HOORAY – HAPPY READER

Hooray for Ronald Murray VE4RE. His article in the January 1974, issue of 73 was basic, simple and very helpful to the newcomer and the not so new person in amateur radio.

I very strongly feel authors (and publishers) blow off the chest and the mouth by writing and publishing technical articles that only electronic engineers can (maybe) understand. This is fine for those interested parties and the prestige of the magazine, but I beseech you to not forget the amateur amateur, like myself. Our needs are very seldom met.

Informative articles that remain basic and noncomplex throughout the length of the discourse would provide some building blocks for the advancement and progress of many hams.

Leo A. Boron WA8SYA
London OH

FIGHT LUNG CANCER SUBSCRIBE TO 73

73 Magazine has many qualities that I admire, but unlike the others that cross my desk, it doesn't have any cigarette commercials. . .hi!

I know the other ham magazines don't carry them either, but they might someday. . .and I hope you hold out against "blood money." Raise your subscription price, or anything else, but let's keep lung cancer out of our hobby.

Andy Anderson K6BBQ
KCBS Radio
San Francisco CA

BUY A LIFETIME SUB – And Help Build a Nuclear Power Plant

Here isa picture of Earl Carrier K8WLP, a Lifetime Subscriber to 73. He is employed by Ludtke Engineering Co., as an equipment operator on a dredge in Lake Erie. The dredge was installing a water inlet pipe at the Davis Besse Nuclear Power Plant being built near Port Clinton OH. While there Earl had clock number 73.

Earl Carrier K8WLP
Sandusky OH

NORWEGIAN LICENSE – ANYONE?

Re the article "Europe On 2m A day," which you published in the April 1973 issue of 73. I would like to add another country to that list – NORWAY.

If you are planning on visiting Norway and would like a reciprocal license write to: Norwegian Telecommunications Administration, Radio Inspection Office, P.O.B. 6701, St. Olavs Plass, Oslo 1, Norway. They will send a form and information in English. The cost is 50 NKr ($9). They require a letter of good conduct from your local police. The form states that it should be returned to them via the FCC. However, I got a letter (valid license with no violations) from the FCC and submitted it with the application and a photocopy of my license. The address is a P.O. Box, but the office is in the same building and in a pinch the license can be issued in person.

Dave Williams K7HMP
APO NY

BRAILLE PUBLICATION

There is now available for blind hams a Braille publication entitled "DX and the Blind Ham." This is a non-profit publication which will give the blind ham much information which was here-to-fore unavailable.

The 78-page book casts $2.84 (which includes handling and postage within the U.S.). International prefixes and locations, compass bearings from three locations in the U.S., distances from these locations and other useful information is given. If you are interested you can send a check or money order to: Peninsula Braille Transcribers Guild, c/o Roy Phelps WB6FIS, 166 Novato Dr., Vacaville CA 95688.

Roy Phelps WB6FIS
Vacaville CA

IRS TEMPORARY – HA! HA!

I have been following the articles in 73 about the IRS for the last few months. I would like to state that I am behind you in your views 100%.

I am led to understand that the Income Tax Bill was adopted as a temporary tax. Ha! Ha! Since that time this tax has turned out to be about as temporary as the Berlin Wall. Personally speaking I would not mind paying the tax quite as much if I could believe that the different income levels were doing their fare share. As it is now the poverty levels are all but exempt, and the wealthy people just hire a lawyer to evade taxation through various loopholes. This leaves the middle, or working class people at the mercy of the IRS.

As an example: My wife and I grossed just over $12,000 last year. We both had claimed 0 dependants on our W2 forms. At the end of the year our totaled deductions came to over $1,300. When we filed our return we claimed two dependants, which should have put us in the clear. We were informed by the IRS that we still owed them money. This taxation, of course, does not include my state sales tax of 5%.

In my opinion, with the rapidly rising cost of living and over-taxation, many Americans have attained a level where unemployment might be profitable. Why then could we not do away with the obsolete income tax program and replace it with a sales tax program? Under this program if you earned more, and spent more, you would pay more in taxes, whereas the reverse would be true in the lower income levels? Would this not be a more fair tax program?

Name Withheld
Dallas TX

IRS PRIVILEGED?

Be careful with whom you discuss your IRS problems. The courts have just recently ruled that any information your attorney may have about you in IRS matters is not privileged information. I have also had some problems with the IRS.

Name Withheld
Garden Grove CA

MORE IRS

Please continue to keep us informed via 73 on the IRS and its tactics of harrassment. 73 has brought forth some very interesting information on those "characters," and it sure is about time that someone opened the lid. I guess the tax collector hasn't changed very much from Biblical times. Perhaps if enough data is collected, you could publish a book on the subject. I would certainly purchase it if you did.

Keep up the good work, especially your articles on IC's and their applications. Good luck.

Name Withheld
Elyria OH

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PROPAGATION CHART

J.H. Nelson

Good (Open) Fair (☐) Poor (O)

1974 March 1974

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3	4	5	6	$\boxed{7}$	8	9
10	11	12	13	$\boxed{14}$	$\boxed{15}$	$\boxed{16}$
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Possible Aurora 4,5.

EASTERN UNITED STATES TO:

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ALASKA	14	7	7	7	7	7	7	7	7	14	14	14
ARGENTINA	14	14	7A	7	7	7	14	21	21	21	21	21
AUSTRALIA	14A	14	7B	7B	7B	7	7	14	14	14	14	14A
CANAL ZONE	14	7A	7	7	7	7	14	14A	21	21	21	21
ENGLAND	7	7	7	7	7	7B	14	14A	14A	14A	14	7B
HAWAII	14	14	7B	7	7	7	7	7B	14	14	14A	14A
INDIA	7	7	7B	7B	7B	7B	14	14	14	7	7	7
JAPAN	14	7B	7B	7B	7B	7	7	7	7	7B	7B	14
MEXICO	14	7	7	7	7	7	7	14	14	14	14A	14A
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PUERTO RICO	14	7	7	7	7	7	7A	14	14	14	14	14
SOUTH AFRICA	14	7	7	7	7B	14	14	21	21	21	14	14
U. S. S. R.	7	7	7	7	7	7B	14	14	14	14	7B	7
WEST COAST	14	14	7	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	7	14	14	14
ARGENTINA	14	14	7	7	7	7	7A	21	21	21	21	21
AUSTRALIA	21	14	14	7B	7B	7	7	7	14	14	14	21
CANAL ZONE	14A	14	7	7	7	7	7	14	21	21	21	21
ENGLAND	7	7	7	7	7	7	7B	14	14	14	14	7B
HAWAII	21	14	14	7	7	7	7	7	14	14	21	21
INDIA	7	7	7B	7B	7B	7B	7B	7B	14	7A	7	7
JAPAN	14	14	7B	7B	7B	7	7	7	7	7B	7B	14
MEXICO	14	7	7	7	7	7	7	14	14	14	14	14
PHILIPPINES	14	14	7B	7B	7B	7B	7B	7	14	14	7B	14
PUERTO RICO	14	7A	7	7	7	7	7A	14	14	14A	14A	14A
SOUTH AFRICA	14	7	7	7	7B	7B	14	14	14A	14A	14	14
U. S. S. R.	7	7	7	7	7	7	7B	7B	14	14	7B	7

WESTERN UNITED STATES TO:

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ARGENTINA	14	14	14	7B	7	7	7B	14	14	14A	21	21
AUSTRALIA	21	21	14	14	7B	7B	7	7	14	14	14	21
CANAL ZONE	21	14	7	7	7	7	7	14	21	21	21	21
ENGLAND	7	7	7	7	7	7	7B	7B	14	14	14	7B
HAWAII	21A	21A	14	14	7	7	7	7	14	14A	21	21
INDIA	7	14	14	7B	7B	7B	7B	7B	7A	7A	7	7
JAPAN	14A	14A	14	7B	7	7	7	7	7	7B	14	14
MEXICO	14	14	7	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	7B	7B	7B	7B	7	7	14	7B	14
PUERTO RICO	14	14	7	7	7	7	7	14	14A	21	21	14A
SOUTH AFRICA	14	7B	7	7	7B	7B	7B	14	14	14A	14	14
U. S. S. R.	7	7	7	7	7	7	7B	7B	14	14	7B	7
EAST COAST	14	14	7	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

73 magazine
for radio amateurs

$1.00
April 1974

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for radio amateurs

163 APRIL 1974

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COVER: Dannine Trapp with WR6AAA, the first repeater in the U.S. to be licensed for remote control. (See cover story on page 93.) The repeater is on Catalina Island, 26 miles off Southern California and is one of the busiest repeaters in the world. The Standard RPT-1 repeater and TPL amplifier setup was sponsored by Ted Henry W6YEY.

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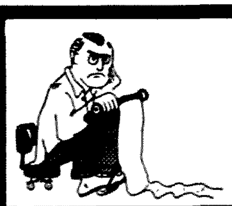

EDITORIAL BY WAYNE GREEN

WHAT IS TAX REVOLT ALL ABOUT?

Why are thousands upon thousands of Americans — loyal Americans — risking troubles with IRS by refusing to fill out the 1040 return? And, more to the point, are they getting away with it or is the IRS moving in and confiscating their property and throwing them in jail?

There are several reasons why this is happening. Some people are fed up with the high cost of government, and their complaints have a lot of substance. Some object on constitutional grounds, and it seems likely that their objections would stand the test of the courts, if they could get a hearing... which is unlikely. Others are fighting the unfairness of the income tax system, which is riddled with tax loopholes for special interests, the result of which is that the tax falls almost entirely on the small taxpayer while big business and the rich go free.

So we have the scene of the IRS concentrating on the people not protected by special laws and large campaign contributions: the small businessman and the small taxpayer. The result is no contest. . .73,000 IRS employees spend over 1½ billion dollars a year and use every means at their disposal, fair or foul, to give the taxpayer the works. Compare that with the post office which has 618,000 employees and a smaller budget! Those are 1973 figures, by the way.

How much of a case do the people have who are opposed to government waste? There have been a lot of books on the subject, and many official studies (which have been largely ignored by the administration) of ways of cutting down government. One measure which might be of interest is the cost per capita per year for the federal government. In 1800 the cost was $2 per capita! In 1820 it went down to $1.90. In 1840 it was $1.85. By 1900 it was up to $7.50. 1940 saw it up to $41.10 each. Just five years later it had gone up to $320 per capita as the Roosevelt administration put hundreds of thousands on the government payroll. In 1960 it was up to $522 and last year it went up to $1365 for each person in the country!

That's quite a growth. . .reminds one of cancer. Unfortunately, firing people doesn't get many votes, so government grows and grows and grows.

There has been a basic change in who is paying the bill. It has gradually changed from industry picking up most of the tab (80%) to the middle income taxpayer, who is now shouldering 80% of the tab. This has been gradual as industry has been able to get Congress to rewrite the tax laws, bit by bit, via contributions to election campaigns, well heeled lobbyists, and payoffs. Unfortunately there has been no well paid lobbyist for the taxpayer, and the result is the present system, which takes about 50% of your income in taxes of one kind or another.

Now, what about that business of the constitution? The argument is that the income tax law violates several constitutional guarantees, the primary being the Fifth Amendment which is supposed to protect Americans against being compelled to bear witness against one's self. The 1040 return, which bears no Miranda warning, clearly violates that amendment. When you fill that out and sign it without crossing out the perjury clause at the bottom, you have born witness against yourself and the IRS can put you in prison. The mere threat of this has forced tens of thousands of citizens to pay whatever the IRS demanded of them, right or wrong.

A number of tax revolt believers have been submitting the 1040 with the perjury clause crossed out and no figures — just their name and address. One of these was taken to court by the IRS and, on September 28, 1973, he won the case. The IRS produced 155 witnesses to prove that the defendant had received an income of over $21,000 during 1968-69-70 and had filed no information other than his name and address. The jury deliberated 15 minutes and returned a verdict of not guilty. After the verdict the prosecuting attorney was reported to have said that if people discover that tax strikers are winning, it will cost billions in lost taxes.

The fourth amendment is supposed to protect you against search and seizure, yet the IRS has made it a practice to come in and seize records and property without court action. This can happen only if you don't know your rights. The IRS has no right to see your records, cancelled checks, etc., without a court order describing in detail exactly what they are to see. . .if it is a check the order should give the date, number, who it is made out to, and the amount, etc.

The IRS works on gall and fear. With the IRS code to back them up, agents feel free to void the constitution, including amendments IV, V, VI, VII, VIII, XIII. Many parts of the IRS code would never stand the test of a court showdown, so agents are very careful about which cases they permit to go to trial and which they settle out of court. As it stands now the taxpayer must bear the entire cost of a trial when the IRS prosecutes him, and that holds whether he is proven guilty or innocent! Even if the taxpayer sues the IRS to get back money taken illegally he must pay all court costs. Further, if the IRS decides to assess you, you are not permitted to take them to court to prevent the assessment. And this is despite the 7th amendment which states that in any matters where the controversy shall exceed $20 the right to trial by jury shall be preserved.

Well, this could go on — it is appalling. A new edition of "Tax Revolt:USA" is available from Liberty Lobby, 300 Independence Avenue, SE, Washington DC 20003 for $5 (unless there has been a price increase).

There is a growing literature of tax revolt. We'll try to keep you informed on what is happening in this field.

One of the basics of keeping the IRS off your back is to be informed about how they work and what their limitations are. Remember that when an agent contacts you to go over your records he could easily be a special agent looking for material to put you in prison. This is particularly important if you have any possible enemies in government or with good friends in government. Remember that sad experience has shown that there are agents who will use every dirty trick known to do you in. When you talk with them. . .if you really feel you have to. . .take along a witness or two and a tape recorder. They will probably drop the whole matter rather than let you make a recording. They have no right to stop you from making a recording. Remember, Miranda warning or no, when you talk with an agent you are confessing and can end up indicted for fraud.

The 1040 return is so complicated and backed up by so many contradictory laws that no two IRS agents can agree on what tax is due in most cases. This makes you a sitting duck, if you fill out the form and sign it, complete with perjury clause. The only law you

have on your side is the law of averages. . . unless you have a sizeable refund coming, the chances are you won't meet your friendly agent. But once you do meet him – watch out!

NEVER EXTEND

When the IRS came to me and asked for an extension, I in turn asked my local lawyer what to do. He said to sign the extension. I have now good reason to believe that I was seriously mislead. Had I had any understanding of the situation and not just depended upon my lawyer for counsel, I would never have signed the extensions.

Just recently there was a case where the Tax Court threw out an extension which was obtained under duress. A plumber won about $28,000 in the Irish Sweepstakes and his lawyer helped him file his tax return in which he averaged the income, a standard technique. Three years later, just two weeks before the time ran out for the IRS to audit the return, an agent called and said he wouldn't allow income averaging on the winnings of wagering. The plumber answered that the ticket was a gift from his brother and not a wager. The agent threatened the plumber with seizing his property if he wouldn't sign the extension, so he agreed.

The court ruled the extension invalid and the plumber didn't have to pay any extra tax.

If you are faced with a demand for an extension, consult a tax attorney, not a family lawyer. Beware of the IRS agents, they have no good things in store for you.

PUNISHMENT BY IRS

When the Justice Department was anxious to get a witness to testify before a grand jury they were apparently able to get the local IRS district director to assess the witness for $1,542,000 and immediately seize his home, automobiles and bank accounts. The witness went to the U.S. District Court and asked for an injunction to stop the IRS, charging the deficiency was a phony to harass him and coerce him into testifying on the other case. He got nowhere until he worked up to the Third Circuit U.S. Court of Appeals, where he finally got an ear. This court instructed the District Court to consider the complaint.

How can IRS get away with things like this? Apathy on the part of the people is responsible. If concerned taxpayers would raise hell – write to Congressmen, newspapers, and protest, these things would be stopped. We get mad when the military dictatorship in Greece pulls stunts like this, but we put up with it when it happens right here in the U.S.

RADICAL CHANGE NEEDED

Many people who have carefully investigated the whole tax setup believe that it is time to sit down and work out a whole new system – one that will be fair for the average man and small business. Is there any good reason why big business should be able to get out of paying taxes almost entirely? And how about the big salaried executives who pay little or nothing? If the load of taxes was split more equitably it would be a lot less strain on the average taxpayer, even without cutting down on the enormously overgrown government.

Most of the systems of taxing that have been proposed would enable the country to do away with the IRS. Getting away from the system that has developed where special interests have been able to sway legislation to protect themselves, leaving the load for the groups without the power, would be a good idea.

This is not to say that it would not be beneficial to cut back on government spending. Many top economists have estimated that the current budget could be cut in half and little in services would be lost.

MORE READER'S STORIES

Another 73 reader called with an IRS harassment story. Seems he was an employer at the time and got a call from the IRS. They claimed that he had not sent in his withholding tax collections for the quarter. He said that he had, and had the records to prove it. They said they had no record of it and if he didn't pay up imediately they would padlock his place. The withholding came to $4200 and the fine was $6100, a total of $10,300 they wanted right on the spot. . .or else.

He managed to come up with the money. Eventually the IRS did get their records straightened out and returned the money, but they left a lot of grey hairs behind them.

And how about the reader who decided the only way he could go was to pay off the IRS at so much a month -- it was just too expensive to fight. So he has to wait for the form to send in with his check each month. But the form often comes so late that it is not possible to meet the deadline, making him liable for a fine. If he sends in the check without the form the IRS does not post the payment and sends him a notice of default, with payment due within 10 days. . . or else.

IRS, CONTINUED

More and more readers are sending in stories of their brushes with the IRS. . .and some of the tales are truly frightening. You may be sure that these will be kept confidential, if you have any news of general interest to the readers along this line.

Several readers have brought this series on the IRS to the attention of their local papers and edited versions of the IRS editorials are being furnished for syndication. In these most of the references to 73 Magazine are removed since paper readers wouldn't understand what 73 is. The more outlets for this information there are, the more likely it is that the IRS will have to back down on the gestapo tactics. You can help.

CHOPPER ONE FLAP

The story in the TV Guide about the February 7, Chopper One program got the 73 phone ringing. It was about an invalid ham operator who bootlegged on the police band with false distress messages. Obviously we didn't need any bad PR like that. . .coast to coast and seen by millions of impressionable kids of all ages.

I tried calling the ABC network in New York and appealing to their better nature with helpful suggestions of multi-million dollar libel suits on behalf of all amateurs, international boycotts of participating sponsors' products, and things like that.

Then I got on 20m and got amateurs all around the country to call their local ABC station and put the screws on as tight as they could locally.

The program went on as scheduled, complete with bootlegging ham raising hob on the police band. It seems that there was this bored twelve year old ham, K6XEG, who found the ham bands dead during the daytime and thus was unable to prevent himself from tuning up on the police (and other bands) and putting in false alarms. His mother wrung her hands, explaining that he was a nice boy, but she couldn't do anything with him.

Guess what ham, after being given a sharp tsk-tsk by the police after sending Chopper One on a wild goose chase to an exploding refinery, just happened to overhear some crooks planning a heist using CB communications? Our ham hero, unable to bring himself to use the telephone when he can zap the police radios, passed the word along to Chopper One direct.

As per Aesop, the police were not all that anxious to buy the story until the kid patched the CB channel through on the police radio for them to hear for themselves. The baddies were caught and the kid given a Chopper ride. They should have thrown him out over Disneyland.

Come on you Californias, don't let these stupid things happen on television. The next time you hear that a ham episode is being put together

SSTV SCENE

Dave Ingram K4TWJ
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Recently, I briefly described research being conducted on the Slow to Fast Scan converter by a group of U.S. hams. Since then I have also received word from Bill Montgomery VE3GZM, and John Vandenberg VE3DVV, on a similar scan converter unit they have been building for feeding Slow Scan into a regular (Fast Scan) TV. Although the two groups have not been in contact with each other the converters are quite similar. The Canadian version is shown in Fig. 1, considerably simplified, naturally. Logic Gating, 2 speed clocks, write/recirculate logic, etc. would be required.

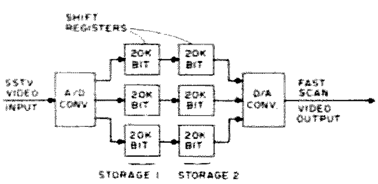


Fig. 1, Canadian version of the Slow to Fast Scan converter.

However, this gives you a fair understanding of how Slow to Fast Scan conversion can be accomplished. The picture is converted into binary code, loaded into "storage 1" at a slow rate, shifted into "storage 2" where it is read out and recirculated at a fast rate, while the next frame loads "storage 1." The D/A converter converts the binary code to Fast Scan video. The unit differs from the U.S. version in that a picture can be viewed from "storage 2" while the next incoming picture is loading "storage 1." Bill and John plan to have a working prototype at the Dayton Hamfest, and would like to hear from any interested parties. Possibly they will be able to furnish descriptive information to seriously interested individuals. Bill's address is 222 Park Row S. #6, Hamilton 24 Ontario, L8K-2K5. The day of the Slow Scan monitor, as we know it. . .with P7 crts and high voltage supplies, may well be on the way out with replacements being converter units that connect between your receiver and, maybe, (visualize this) a large "wall tv." But don't take this wrong. . .shift register storage units are still presently too expensive for commercial manufacturers to use. Hams can build these units using surplus memories because their units do not demand 100% reliability.

Incidentally, I have just heard over the air that WB9LVI, has a digital slow to fast scan converter working, and his unit interfaces to an oscilliscope, rather than a tv. This was sort of a surprise because very few people even knew he was working on a scan converter. His approach eliminates the need for generating a "channel 5" tv signal, at the expense of requiring an oscilliscope. . . interesting. I hope to have more information on his unit soon.

I wonder if you have considered using your camera as a common Slow Scan generator for other video sources like, for example, a Flying Spot Scanner? One suggestion for accomplishing this is shown in Fig. 2. Sync *pulses* could be taken from the camera to trigger the extra sweep circuits in the Flying Spot Scanner, and a SPDT switch added to the camera would select either the internal or external video input. The "output level" pot would be adjusted to equal the signal level from the camera's previous stage. High voltages (excluding accelerator and phototube voltages which could be obtained from a simple flyback oscillator unit) might also be obtained from the camera in some cases. Although I never ran into the problem of two sweep circuit inputs loading down a pulse generator, (sync circuits). If I had a simple one transistor dc amplifier with an input resistance of about 250KΩ for isolation, it would have overcome the problem. (It could even invert if you had the wrong phase polarity.) I rigged up an arrangement somewhat similar to this a while back when building my 12" monitor. I was not sure about how bright or sharp the picture would be, or if my yoke would line up properly. (Actually, I was too anxious to see a 12" picture!) So I paralleled my newly built sweep circuits with the ones in my W6MXV monitor, applied voltages from some other circuitry I was also testing, and it worked fine. In fact, the next time I have the 'MXV' monitor down, I plan to add "sync

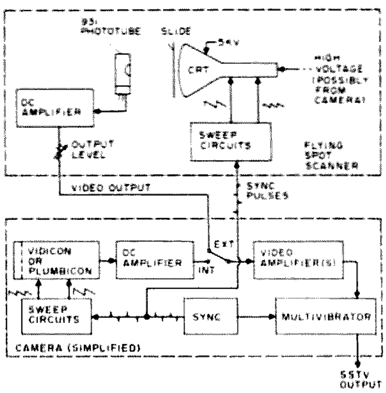


Fig. 2, Schematic of how you can use your camera as a common Slow Scan Generator.

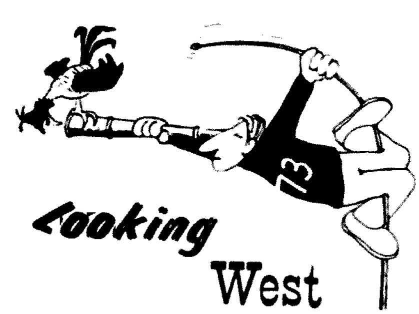
pulse output" jacks to the unit for testing future circuits or simultaneously running two picture tubes off one monitor. By employing the previously mentioned ideas, one should be able to expand his present Slow Scan gear at a minimum of cost and effort. After all, why build unnecessary circuitry, eh?

The WØLMD Slow Scan TV Keyboard is really catching on, and quite a few of the fellows have presently built working copies. I understand VE7JA is producing pc boards on the unit for a reasonable sum, and that Meshna Electronics in Massachusetts has ASC11 keyboards. . .some as low as seven dollars. (Surplus. . .better check them before buying them at that price.) It looks like the keyboard is destined to become a real "biggie."

Don't forget the Dayton bash coming up later this month. There's quite a bit of Slow Scan activity planned and it looks like some revolutionary ideas may be revealed. In fact, I have *just* received word Robert, WØLMD, has his Slow to Fast Scan converter going and is watching Slow Scan pictures on a regular tv. The unit uses 130 ICs, and Robert will have it at Dayton!

K4TWJ

This month's picture shows the elaborate setup at W6KZL. Glen is an old DXer with a top country score and an impressive mobile DX record to boot. He, like many of us, has found Slow Scan TV the "most fascinating mode" of today. The Robot Camera is on the left and looks either at the operating position or into the box below the camera. The box houses four 60-watt lamps on a variac and an adjustable shelf. Next is the 10" W6MXV monitor and below it is the homebrew flying spot scanner on the left and 5" MacDonald monitor (note viewing hood) on the right. Moving on around is the Sony Cassette Deck, 75S-3 receiver and Swan 500-CX. The unit above the 75S-3 is a 4-1000 kw linear. Power supply is in his garage (!).



Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA 91402

LOOKING WEST

A 34/94 repeater is on the air in L.A. – on 220 MHz, that is. While much of the planned activity for 1¼m came to a screeching halt when we heard that the upper part of the band was to become a citizens radio service, not everyone was scared off by the news. It is a fact that there is probably more 220 FM activity in L.A., than in the rest of the country combined. We have five open repeaters on that band, the latest of which is the proud work of Warren Andressen WA6JMM. Warren originally started the project with Bill Duhaime WA6NTW, of ICOM FM Sales in L.A. Due to an unexpected increase in his workload, Bill had to actively drop out of the machine's development for a while. But Warren carried it on and now has a working system that all reports say is top notch. By the time you read this the repeater will be installed in its permanent home some 1200′ above the L.A. basin and open to all who wish to use it. Thanks to Warren's craftsmanship and Bill's site, another inroad has been made in the effort to keep 220 in the amateur service.

SOS can stand for more than just what we have become accustomed to having it mean. Recently, it became the unofficial name for a new simplex users group that is in the process of forming. *Save Our Simplex* is made up of those amateurs that feel repeaters are beginning to encroach on too much of the available band spectrum and feel that their voice has gone unheard in FM's development. The initial aim of this organization is to oppose the establishment of the disputed 34/94 repeater in the Los Angeles area. They have a further goal, though, of protecting well established simplex channels from being repeaterized. Again, it must be emphasized that there are almost as many hams on simplex out here as there are repeater operators; not all amateurs are repeater oriented. Simplex, as well as remote-base operation on simplex channels is a well established way of life in and around L.A., and many want it to continue. Though the organizational name may change, at present a committee is hard at work writing a charter and set of bylaws for the group. I suspect much more will be heard from them since they constitute a considerable part of the L.A. FM scene.

WA2HVK/6

50 MHz BAND

Bill Turner WA0ABI
Five Chestnut Court
St. Peters MO 63376

WB4EOW wrote in mid-January inquiring as to where he might find an SB-110 for sale. A week later I received another letter saying he had found one. Ron says the January contest was a failure from Huntsville, Alabama. He heard some good scatter but with only a single 6146 and four elements at 35′ he couldn't make the grade. He did manage 11 groundwave contacts in four states. W8CCI was the high point of the contest, running S7 on groundwave into the converter/2B receiver.

WA7ECY writes from Gresham OR that he runs an SB-110 and 6 elements on SSB and also has AM and FM capability on 6m. Scott lists 40 contacts in 8 states during January. Best DX for the month was WB4GIJ in Memphis TN. Scott mentions excellent success in working Southern California on scatter during weekends. Neighbor K7ZCB is running a TR-6 and 6 elements. Newly active in the vicinity are WA7WVN in Portland proper and WA7RED across the Columbia River in Vancouver WA. It sounds like Portland is becoming a hot bed of activity.

The latest SPESM newsletter suggests that anyone interested in the passage of HR3516 (authorization for the FCC to require filtering in TV sets to eliminate interference from amateur and CB operating within their assigned allocations) write The Honorable Harley O. Staggers, Chairman, House Interstate and Foreign Commerce Committee, 2366 Rayburn Building, Washington DC 20515, to express their views. I have also received a copy of a petition calling for passage of HR 3516 from WA9UBI. If you want to put an end to the majority of TVI complaints by requiring manufacturers to design to a quality standard rather than a price this is your opportunity. Write your letter or petition, talk it up on the air, bring it up at club meetings. Only by massive reaction do we stand a chance of passage.

Ray K5ZMS/5, says SMIRK has grown to 62 members in 14 states and 2 foreign countries. When membership reaches 100 an additional awards program will go into effect for contacting 100, 250, 500 and 1000 members. The Texas SMIRK net meets at 8PM Central on 50.2 with 50.175 as alternate. Additional state nets are planned as membership allows. To become a member you must contact 6 current members and send their call, SMIRK number, date and time of contact along with $2 to cover printing and postage to Ray at 7158 Stone Fence Drive, San Antonio TX 78227. In return you will receive your membership certificate, SMIRK number and a copy of the club by-laws. There is no additional fee for the awards program.

Spectrum International, P. O. Box 1084, Concord MA 01742, distributes the Microwave Module Ltd line of converters for 50 through 1296 MHz. The manager of that organization was kind enough to provide a sample 6m receiving converter, the MMc 50, for evaluation. Over a 30-day period the converter was used on groundwave, scatter and Es. The results were very good in all cases. Sensitivity and noise figure were excellent when used ahead of a popular transceiver tuned to the 10m i-f. Dual-gate protected MOSFETs are used in both the RF and mixer stages while a bipolar is used in the oscillator. All the transistors are "made in U.S.A." types, should replacement ever become necessary there would be no problem in finding spares. The converter is housed in a die cast box with BNC fittings for RF connections and feedthroughs for the power supply. The printed circuit board quality and workmanship are as good as you will find anywhere. The entire design and construction are well carried out and leaves little to be desired.

There are several options available among which are an oscillator output for frequency measurement or use in a transmitting converter and special low noise figure units, though the latter would be gilding the lily for 6m where external noise predominates. I am told that Spectrum International measuring equipment which is put to work to wiring the last little bit from each unit.

The specs at a glance are:

Size	11.43cm x 6.35cm x 3.18cm
Power Requirement	12VDC @ 20mA
Impedance	50Ω in/out
N.F.	2.5dB
Gain	32dB
Price	$53.70 F.O.B. Concord MA

WA0ABI

INTRUDER CHASE

Jonathan Tara WB8DBN
16260 Greenfield
Detroit MI 48235

In this month's column there are two Intruder Chase lists. The first list is of every Intruder except Radio Moscow. Radio Moscow's operations on the 40m band are so extensive that I have included a separate listing of them. If you know of any corrections to be made in either list, let me know so that I can update them.

The RM 7240 transmission is being jammed *very* effectively by someone. When I called the FCC to find out where the jammer was, they said that they "couldn't give out that information." I thought we stopped jamming back at the Bay of Pigs.

This is one of the big reasons for the Intruder Net. If the FCC won't tell us where they are, we can find out for ourselves. When we do, *someone* is going to be embarrassed. Jamming of this type won't help anything. Since RM knows that it is intentional, they will continue their transmissions on this frequency to protect their other ones. However, if they get complaints that SWL's are not hearing them through the hams, hopefully they will give up the entire 40m band. Unfortunately, during the early part of the transmission to the U.S. *all* of RM's non-40m frequencies are effectively jammed. Obviously, we will have to concern ourselves with these jammers, before we can convince them to give up 40. Except for the 7240 jamming (sweep type) and an occasional "noise" jammer on 7280, the 40m transmissions are clear. Possibly the others are done by VOA stateside transmitters which can't legally go on 40, so that's why they are so clear. This is purely conjecture, but the most likely country to jam transmissions to the U.S. is the U.S.

I tried the W2EEY active DF antenna from the October 1973 issue of 73, but was extremely disappointed with it. The antenna works better without the transistors than with them. . .I'll try a modification of the ARRL 80m DF antenna in the ARRL Antenna Handbook for 40, and report on it next month if it works well.

The Association of North American Radio Clubs has started up a frequency coordination committee. They will recommend frequency changes to broadcasting stations to avoid conflicts between interfering or potentially interfering stations. Hopefully they will be able to give us some help on 40m.

A new one I'd like some reports on is the Swiss Broadcasting Company on 3985, with an *omnidirectional* antenna. I think we have a case here, because of the antenna, even though broadcasting is legal between 3.9 and 4.0 MHz. The transmission I heard was in English from 0700 to 0730. Also, a new (as far as I know) intruder is now on 7095 from 0500 to 0530 Sunday UT (Saturday Local) in French with no interval signal. Maybe someone out there who knows French can identify this one. I have a tape if someone wants to translate it. However, it is quite loud. The only thing listed on this frequency is Tirana and Peking, and it doesn't sound like either one of these. Also, the 7064.5 transmission from R. Iran seems to have been discontinued. The numerous Chinese transmissions at the bottom of 40m are starting to come through on the East Coast. . .now I know what it's like on the West Coast.

Congratulations to the ARRL for their handling of the RTTY mess on 20m. I guess this was enough to push them over the edge into action for a change, rather than sitting there collecting information. This signal seems to have settled in around 5.8 MHz, a comfortable distance from 20m.

It seems that a lot (if not most) of Russian military communication is carried on in CW, much of it in ham bands. Quite often the stations are "disguised" as hams by using a call similar to U.S. ham calls. However, the Russian military is either incredibly stupid or else they don't deliver callbooks to Siberia. They can usually be distinguished by their "funny sounding" calls. Like, would you believe a two letter WB6 call. . .? If you work CW look out for this type of thing. Many times hams have been heard trying to QSO these stations, unknowing of what they really were. Needless to say, they won't answer! I have heard stories about hams learning enough about their net procedures to actually check in and send them on a wild goose chase, but I'm not recommending this!

If you haven't tried a QSO zero-beat with a broadcaster (dubbed "carrier riding" by K6KA) give it a

INTRUDER LIST

Frequency Actual	Listed	Station	Time	Language
3952	X	BBC[1]	0545-	English
7050		R. Cairo (V. of the Arabs)	0300-0800	Arabic
7063	7065	R. Tirana	2200-2230	English
"	"	" "	2230-2300	French
"	"	" "	0000-0030	English
"	"	" "	0100-0200	Portugese
"	"	" "	0330-0400	Arabic
7064.5 (WC)	"	R. Iran	0200-2000	
7075		R. Cairo	2100-2355	Arabic
7090		R. Tirana	0430-	
7095 (WC)		R. Peking (Home Service)	2038-1615	
7100		R. Station "Peach & Progress"[2,3]	0000-0030	English
"		Trans World Radio[2]	0720-0850	English
7120		R. Peking[3,5]	0000-0055	Spanish
"		R. Peking[4,5]	0100-0155	English
"		R. Peking[3,5]	0200-0255	Spanish
"		R. Peking[4,5]	0300-0355	English
7150		BBC[1]	0545-0915	English
7240		BBC[1]	0545-0915	English
	7260	BBC[3]	2200-0015	Spanish
	"	BBC[6]	0015-0415	Spanish
21450		Voice of America[7]	1520-2000	Russian

1 "Australian" Service
2 Lower sideband extending into exclusive amateur portion
3 Latin American Service
4 North American Service
6 Tirana Relay
7 Beamed to Northern part of South America
8 Splatter to 21435 (SSB)

WC Most likely only heard on the West Coast.
X The transmission is not included on the stations schedule.
A blank under "Actual" means that the transmission is listed in the station's schedule but has not actually been heard.

RADIO MOSCOW

Time	Language	Frequencies	Notes
2300-0030	English	7105 (7100), 7150, (7160), 7185 (7180), 7205.02 (7200), 7240, (7260)	7240 jammed
0030-0100	Spanish	7105	
0030-0100	English	(7130), 7150, 7185 (7180), 7205 (7200), 7240	"Radio Kiev" 7240 jammed these xmsns only on Tue., Fri., and Sun. UT
0100-0300	English	7105 (7100), 7150, 7165 (7160), 7185, (7180), 7205 (7200), 7240, (7260)	7150 jammed starting at 0200 B2 0200 signals fading
0200-0300	Spanish	7100, 7150	
0300-0330	English	7130, 7260	Both freq's weak and covered B2 QRM "Radio Kiev"
0300-0400	English	7150, 7165 (7160), 7185 (7180), 7205 (7200), 7240	
0300-0400	Spanish	7100	Lower SB in exclusive amateur portion
0330-0730	English	7170, 7260	To W. Coast of U.S.
0600-0730	English	7110	

try. Some are skeptical about the interference potential of this on strong stations like Radio Moscow. The first hour or so of the RM transmissions are quite loud, but after that they go downhill, and you need an absolutely interference-free frequency to hear it after that. Radio Moscow repeats it's hour-long transmission to the U.S. four times, with the last three repeats on 40 being highly susceptible to QRM. Maybe we can at least get them to stop these redundant later transmissions. As far as communicating over the later transmissions of RM, it works quite well with locals and sometimes non-locals as long as you keep the RF gain down. I heard a W7 tearing up RM completely the other day. The important thing is to put these frequencies in use, instead of leaving them clear for the broadcasters to use.

WB8DBN

NEW PRODUCTS

NOVICE THEORY CASSETTE COURSE

All the theory you need to pass the Novice exam is contained on four one-hour cassettes. The first three cassettes take you step by step through the basics of electrical and electronic theory, tubes, transistors and antennas. The fourth cassette has questions and answers – up to the minute questions and answers.

Since most people learn much better by listening than by reading, and since a cassette course such as this can be played while you are driving, eating lunch, or at any other time you have an ear open, you don't even have to sit down and work up a sweat over your books.

You can even play it in your sleep and let it soak into your subconscious!

The entire course is taught by Wayne Green, and it's ad lib, not read out of a book. The basic text used for guidance on the material covered is the 73 Novice Study Guide ($4).

This set of four one hour cassettes would cost $25 just about anywhere, but 73 is in the magazine business, and the more Novices there are the more 73 readers there will be. . .so the price for this four cassette set, complete with a copy of the full latest FCC regulations, is only S13.95!

If you got your ham ticket by memorizing the ARRL Q&A Manual, perhaps its time for you to take this easy road to learning the basics of electronics.

In the works are cassette study courses for the other classes of licenses. They'll be announced when they are ready. For the first time it will be possible to go way beyond even a college course in electronics via tape cassettes. . .and nothing could be easier to learn from.

COURIER MOBILE MIKE

Fanon/Courier has introduced a newly designed handheld microphone – the Courier Model CMM-1, human engineered for maximum convenience and for best mobile sound quality. The CMM-1 Mobile Mike, now standard on all new Courier rigs, is sculptured to fit snugly into the palm of the hand, but can alse be gripped and held "palmdown." "No-pinch" switching may be accomplished by the use of thumb or index and second fingers. Deep horizontal ribbing and extended edges act as acoustical barriers to background noise yet provide for the full use of directional voice sounds.

The CMM-1 Mobile Mike is constructed of high impact plastic in order to withstand shock and rough handling. It comes equipped with a standard double pole, double throw switch such as those used with most transceivers and with a coiled six foot cord. Wiring instructions are provided for use with equipment using other plugs and connectors or electronic switching. A microphone hanger is also included.

For further information contact: *Fana/Courier Corp., 990 South Fair Oaks Avenue, Pasadena CA 91105. 213-799-9164.*

1GHZ DATA SHEET AVAILABLE

An advanced line of 1GHz transistors is described in a data sheet available from TRW Semiconductors, an Electronic Components Division of TRW Inc. The improved line features gold metallization and reduced package parasitics that increase reliability, gain and power output over devices previously available.

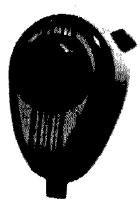
Devices in the 1GHz series are rated for 1, 3, 5, 10 and 20 watts. Minimum gain at 1GHz is 5dB for the 1 and 20 watt devices and 6dB for the 3, 5 and 10 watt devices.

The new units are for use in the range 500 MHz to 1GHz and are intended for application in high frequency communications in aerospace, military and industrial equipment.

The 8 page data sheet provides complete ratings and electrical characteristics, package dimensions and representative power curves for each device. The data sheet also presents an extensive amount of applications information for circuit designers, including a discussion of metallization and reliability, input and output matching networks, and blocking and bypass capacitor selection. Schematic diagrams and parts lists are given for circuits used to derive performance data.

Further information and a copy of the data sheet are available from: *Sales Manager, TRW Semiconductors, 14520 Aviation Blvd., Lawndale CA 90260. 213-679-4561.*

NOISE CANCELLING NC350DM TURNER MICROPHONE



Turner's new NC350DM was designed specifially for use in mobile communications applications where traffic, equipment, motor or any other unwanted background noise presents a problem.

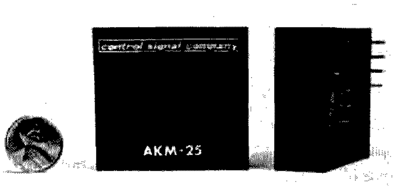
The Turner NC350DM has a frequency response of from 100-8000 Hz. Impedance is 2000 ohms for use with all transistorized equipment with input impedance from 600 to 5000 ohms. It has an output level of -60 dB.

The case of the Turner NC350DM is manufactured of black cycolac and has a steel mesh grille with a soft rubber lip guard. It has a neoprene, 3-conductor, (1 shielded) coiled cord which is strengthened by a telephone type, strain relief grommet.

The Turner NC350DM is wired for relay switching, but can be easily converted to electronic switching.

For more information contact: *Turner Division, Conrac Corporation, 909 17th St., N.E., Cedar Rapids IA 52402. 319-365-0421.*

AUTOMATIC KEYER MODULE



Control Signal Company of Denver has just announced the availability of the smallest, most complete automatic keyer module ever seen. QRP fans should note that this little critter draws less than 1 mA from a 9V battery when keying, and that the Company reports difficulty in measuring the infinitesimal current when the key is up. Any supply voltage from 4 to 15V dc may be used.

Homebrewers will be impressed that the module is smaller than a pack of cigarettes and weighs only 2 oz.

Modern technology has not forgotten the CW man! This bite-size dude has dot, dash and space memories for perfect jam-free keying, and has a 6 to 60 WPM speed range capability. And would you believe a sidetone monitor is squeezed in there too! For more information contact: *Control Signal Company, 5964 W. Columbia Place, Denver Co 80227. 303-794-7234.*

LOW LOSS COAXIAL CABLE

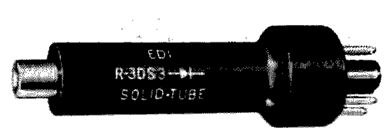
Antenna Specialists Co., entered into a joint development with one of the major cable manufacturers to find a good cable for UHF mobile installations that combined the low loss of RG8/U or ¼" Heliax with the flexibility and ease of installation of RG58/U. The result was Pro-Flex 450^{tm}. Because its diameter is larger than RG58/U it requires the same reducing adapter or connector types as RG59/U cable. However, it *is* a 50 ohm cable.

For more information contact: *Antenna Specialists Co., 12435 Euclid Avenue, Cleveland OH 44106.*

KIRLIAN PHOTO KIT

In the June 73 editorial a mention was made of Kirlian photography, about which little is yet understood. Some of the reported results are incredible. Systems Concepts, Box 417, W. Hyattsville MD 20782 has a kit available for $20 and includes a high voltage generator, discharge plates, print paper, developing trays, chemicals and detailed instructions. The partners in the concern are K3TJC and K3TIY. Here's a field just made for amateur experimenting.

NEW SOLID-TUBE

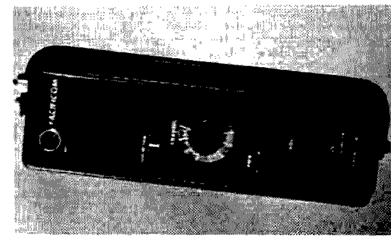


Electronic Devices Inc., has added a new model to their Solid-Tube line of silicon, solid state, plug-in rectifier tube replacements. The new model, Solid-Tube R-3DS3, replaces vacuum tube rectifiers types 3DR3 and 3ES3.

This new model joins the other Solid-Tubes in the EDI line in providing a number of advantages over the vacuum and gaseous tubes that they replace. The Solid-Tubes emit no X-radiation, create no heat, provide greater reliability, and since they have no filament they make ideal substitues in cases where the filament or flyback transformer is faulty.

For complete information on this new tube, as well as the full line of Solid-Tubes and a complete substitution chart write: *Sales Manager, Electronic Devices, 21 Gray Oaks Avenue, Yonkers NY.*

NEW 2m UNIT



PACIFICOM, makers of Marine Gear, is getting into the 2m ham business with the introduction of their Model 200 Hand Transceiver. It offers 6 channels, 100% solid state, "Signal Sampler" battery-saver circuit, Operates on batteries or from 12V external power, dual purpose antenna, instantly converts from fixed mounting to portable, plus many more features.

For more information contact: *PACIFICOM, 3939 Ruffin Rd., San Diego CA 92123. 714-565-7945.*

DUAL SOLID-STATE TIMER FOR $1.25

A dual electronic timer in the form of a monolithic IC has been designed and developed by Signetics Corp. for a wide range of uses, including replacement of time delay relays. Both halves of the NE/SE556 dual timer can operate independently as well as together. They will produce fully controllable time delays between one microsecond and one hour. Timing is adjustable over a ratio of 10:1. The dual timer can also be connected to run free, in which case each half can be set to oscillate at any frequency between 300 kHz and less than one pulse per hour. Duty cycles are adjustable from 50% down to 0.01%.

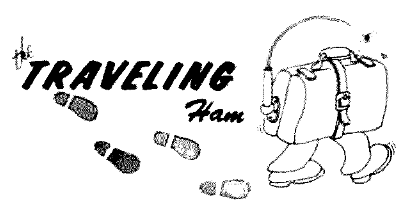
For more information write: *Signetics Corp., Sunnyvale CA.*

SEMICONDUCTOR MEMORY DESIGN AND APPLICATION

Semiconductor Memory Design and Application by Gerald Luecke, Jack P. Mize and William N. Carr presents a comprehensive guide to the application of semiconductor storage elements in the construction of larger memory systems (McGraw-Hill, $18.50).

The first text to analyze emitter-coupled logic (ECL) integrated circuits, it reviews the evolution of semiconductor technology through its present state. The ideas and techniques necessary in building electronically competitive, cost-effective memory units are systematically detailed. The probably direction of future developments is also discussed.

To order write: McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, New York 10020.



Becoming /4X is very easy. After arriving in Israel you can go to the licensing office and ask for it, they will oblige you.

Of course there are a few formalities and one or two minor details to take care of first. Number one is to find the place. It is located in the Shalom Tower, one of the two tallest buildings in the city. If they put a repeater up there it could probably cover the whole Mideast. The other tall building is the diamond bourse located in Ramate Gan. If all other techniques fail, just remember that the number 12 bus drives through it, literally. The tall or high rise part of the building is built over two smaller shopping/office buildings, one of which is the only American bank in the country. The style is rather like a house made out of building blocks in which two blocks support the rest, and the busses drive through the gap.

When you get there take the elevator to the 9th floor. Ask at the information desk on the 9th floor for "amateur radio." You will be directed as to how to proceed to Room 8 on the 10th floor which is not as easy as it may sound.

Getting a license to operate /4X is simply a matter of filling out a form and then handing it over together with a photocopy of your license. In return you get a permit to operate /4X at no charge. Mind you, you have to specify each QTH and the equipment you will be operating. They are not set up as yet to issue permits for short periods, because as yet visitors do not bring equipment with them for short stays. There is a 2m repeater in Haifa, so it is possible that they will issue permits for VHF only operation in the future.

If you intend to visit Israel, I'd suggest that you write first and get the forms and a set of the rules and regulations, if for no other reason than that they might help you answer any problems raised at the airport when you try to bring gear into the country. The address is: Ministry of Posts-Engineering Services, Amateur Radio Licensing, 9 Achad Haam St., Tel Aviv, Israel.

If you are not going to take equipment with you, you might be interested in operating a station belonging to an Israeli amateur. In that case set it up before you go, because the Israeli whose station you want to operate handles all of the paperwork.

G3ZCZ

Tom DiBiase WB8KZD
708 6th Avenue
Steubenville OH 43952

APR 12-15	County Hunters SSB Contest
APR 20-22	Zero District QSO Party
APR 27-28	Florida QSO Party
MAY 11-13	Georgia QSO Party
MAY 18-20	Connecticut QSO Party

THIS MONTH

County Hunters SSB Contest

From 2200Z April 12, to 0500Z April 15. Frequencies – low end of General Phone bands. No credit for contacts on the 3943, 7243 or 14336 nets. Exchange report, county and state (DX give country). Mixed mode contacts OK if one station on SSB. Scoring: Contact with (A) a fixed station – 1 point, (B) DX stations – 5 points, (C) Mobile stations on 14 MHz and up – 5 points, (D) Mobile stations on 7 MHz and below – 10 points. Multipliers: For fixed stations – total U.S. counties worked, for mobile stations – total U. S. counties worked plus number of counties given out. Logs must show: date/time, stations worked, exchanges, claimed points per contact, numbering of each new multiplier. A fixed station may be worked only once. Portables and mobiles changing counties may be reworked. Portable stations are considered fixed for scoring purposes. Mail logs to: James Willingham KØARS, Route 2, Bevier MO 63532. Deadline: June 1, 1974. Appropriate awards. Summary and log sheets free for SASE to above address.

Zero District QSO Party

From 2000Z April 20, to 0200Z April 22. Suggested frequencies: 70 kHz from low edge of HF CW bands, 3900, 7270, 14300, 21370, 28570 on SSB. Novices try 3725, 7125, 21125. Exchange RS/T, QSO number, section, and Zeros also send county. Stations may be worked once per band. Multiplier for Zeros: total sections, Zero counties and foreign countries. Multiplier for non-Zeros: total Zero sections and Zero counties. Appropriate awards. Logs by May 17, to TRA ARC, WAØTKK, Wilson Hall, Iowa State University, Ames IA 50010.

Florida QSO Party

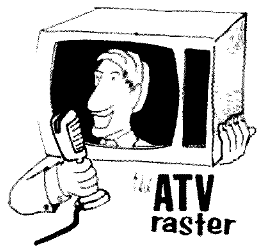
April 27 and 28, 1500Z to 2000Z on the 27th, 0000Z to 0500Z and 1400Z to 2359Z on the 28th. Suggested frequencies: CW – 1808, and 80 kHz up from the edge of each 3.5 to 28 MHz band, SSB – 1818, 3980, 7280, 14318, 21380, 28580. Florida stations send RS/T and county, non-Florida stations send RS/T and State, Province or Country. Stations may be worked once per band/mode. *CW and Phone are separate entries and are to be summed for Florida Club Aggregate entries only.* Florida stations score 1 point per QSO. Maximum multiplier is 73 (49 states, 12 Provinces, and 12 DX countries). Florida clubs may total their member's single-op CW and/or Phone scores, and enter this total in the Club Aggregate category. A member's single-op score may also appear in the single-op CW and/or Phone categories. Non-Florida score 1 point per QSO times number of Florida counties worked (67 maximum). Appropriate awards. A summary sheet with your name, call, address, claimed score, category and customary declaration *must* be included. *No messy entries!* Mail logs and summary sheet to be postmarked no later than May 30, 1974 to: Florida Skip, Contest Chairman, P.O. Box 501, Miami Springs FL 33166. Enclose an 8¢ stamp for results.

Please remember that I must have all information on a given contest at least 3 months prior to the date of that contest. I have a deadline to meet, and lately I have just about finished doing the column and someone sends me their information late, and I have to start all over, causing *me* to be late. In the future, such late information will have to be discarded, because I have an obligation to the readers to meet my monthly deadline. Thanks.

KR6 CERTIFICATE AVAILABLE

The Radio Society of Okinawa still awards KR6 Certificates. To qualify for this Award all QSO's must have taken place prior to the reversion of Okinawa to Japan on May 15, 1972. Requirements for the KR6 Award: 5 IRC's or 1 U.S. Dollar. A signed log book extract of 5 QSO's with KR6 operators verified by two licenses amateur radio operators, or by an official of a recognized Radio Club or Society. Submit all applications to the Radio Society of Okinawa, P.O. Box 465, APO San Francisco CA 96331.

WB8KZD



Terry Fox WB4JFI
3612 Barcroft View #302
Baileys Crossroads VA 22041

THE ATV RASTER

First of all, I would like to bring everyone up to date on the ATV repeater. As you probably read last month in 73 the license came on January 25, and the first QSO through the machine was on January 27, while testing it. We still have some finishing touches to do on the machine but all in all it looks pretty good. During the tests I was able to transmit a snow free picture up to the repeater and copy its downlink back with a broadcast quality picture. I was able to do this because its signal was strong enough to override mine. I was using a UHF loop antenna on back of the converter. It looks like the repeater is doing better than we had expected.

I would like to bring A5 MAGAZINE to the attention of all ATVers and potential ATVers. This is the only U.S. magazine devoted entirely to Amateur Television, and is a must for anyone interested in this mode. Its subscription rates are $2.50 a year for six issues. Its available from A5 MAGAZINE, P.O. Box 6512, Philadelphia PA 19138. I know Wayne won't mind a plug for another magazine if it helps readers in their continuing quest for knowledge. Unlike another New England based outfit 73 seems to give credit when its due, like when it comes to referencing from other articles in other magazines. But enough politics and back to ATV.

Many hams interested in getting on ATV probably ask themselves, "How do I get started? Since it is television, I must need racks of equipment and a spare kilobuck." *Nonsense and bunk!* Even if you're not interested in ATV read on, we might convert you.

Probably the easiest way to receive ATV is to buy a UHF TV converter. They are available from most of the mail order houses at good prices. I got mine from Lafayette for under $25. Its a Blonder Tongue model BTX-111. They also make a BTX-999 for around $20, but its a little harder to convert. To convert the BTX-111 you first remove the unit from its plastic case by taking out the six screws for the antenna connections in the back, then gently push on the visible metal in the back until the chassis slides out. The next step is to remove the metal bottom by taking out the small screw with the hex head in the center of it. Now, if you hold the unit with its front toward you, you can see the power supply and output amplifier in the left half and the UHF converter itself in the right half. The converter section is broken up into three sections. Furthest away from you is the input filter section, next is the mixer and the front section is the converter's 1.0. In each section there is a semicircle of metal with a sliding tab that shorts it out to ground as you tune the unit. These are the inductors in the tuned circuits. One end of each inductor is hooked directly to the chassis and the other is attached to a terminal strip. Right next to the terminal side of these inductors are little metal tabs that are soldered to the chassis and run parallel to the inductors. These tabs are capacitors that are used to tune the unit to proper frequencies. All that is required to put the converter on ATV is to bend these strips closer to each inductor. It is advisable to have a calibrated signal generator handy to check both frequency and sensitivity. If one is not available, try to find a ham running ATV in your area and tune the 1.0 capacitor while close to his transmitter, then adjust the mixer and filter trimmers when further away from him. If you can't find an ATVer around, as a last resort, find a commercial UHF TV station and then tune the 1.0 so this station appears approximately 15 channels higher than its actual number (example: channel 20 should be up around 35). Then you can peak the mixer and filter for maximum signal. Also, the metal bottom does affect the tuner slightly, so check it with the cover on before putting it all back together. Now the converter should be tuned up to cover the entire 420-450 MHz ham band. This full coverage is especially important if there is even the slightest possibility of an ATV repeater in your area. The only other thing you might need for receiving is a preamp. The best sensitivity that you can expect from a UHF converter alone is about -80dB for 10dB quieting of the audio in the TV receiver. In addition, the UHF converters usually don't use very good mixer diodes, so their noise figures are fairly poor and a good preamp would help this tremendously.

At the transmitting end, the best way to get on is to find a Motorola T-44 or RCA-CMU-15 450-470 MHz FM transmitter strip. These two are by far the easiest ways to transmit ATV. Both units pump out about 15 watts average when video modulated and they require next to no modification to get working. The only modulator that we have had luck with is the one described in the December 1972 and February 1973 issues of QST. All the other modulators require modification of the grid bypass capacitor to achieve proper bandwidth. Since this modulator has an extremely low output impedance no modification of the T-44's grid bypass is required. This is good because we have had several calls from around the country from hams that have modified their units, with resulting problems like wiped finals from oscillations in the output amplifier, low or no power output, etc. . .so please, *leave that bypass alone!* The WØMZL modulator is a very simple 4-transistor unit of the complimentary-symmetry design for low impedance. All the transistors cost less than one dollar each, so it's also rather inexpensive.

Incidently, if you do have a complete T-44 don't throw away the power supply or receiver. The receiver can be used as a UHF to VHF converter since its first i-f corresponds to TV channel 4. Shortly I will be showing you a one tube cathode follower circuit, so you can use the T-44 for your UHF converter. Also, the power supply is a good thing to keep, in case of emergencies you can run ATV mobile. The only problem with this is that you had better have a good battery and suspension, or the T-44 will show you otherwise very quickly. I will be describing more of the transmitting end of ATV later, for right now just try to find a T-44 or CMU-15 transmitter strip.

For those of you interested in putting up an ATV repeater, we will be making available copies of the application and some basics of how we got it up as soon as we can. Our repeater uses a T-44 transmitting strip exciting an AM-1178 amplifier with a 4CX-250K tube. The receiver starts with two interdigital filters to suppress the transmitters signal, then a preamp and then the T-44 receiver strip whose first i-f is coupled to a TV set modified for video output, which is fed back to the transmitter. The transmitter and receiver are connected to a ten dB gain Phelps-Dodge antenna through a diplexer. Later, we are going to replace the diplexer with a circulator, so we can pick up an additional six dB through the system. We have in our control circuitry a horizontal sync detector, so the repeater won't key up on just a carrier. In addition, we have both video and audio I.D. from a charactor generator and audio tape.

I think that I had better wrap things up for this issue, and continue next month. Till then, 73's & BCNU on 439.25MHz ATV.

WB4JFI

AMSAT NEWS

Michael Frye WB8LBP
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Dayton OH 45429

Most of this months column is a status report for (A-O-B), which from all indications should be launched sometime in July of this year.

A summary of operation results from OSCAR 6 is now available and an edited version will appear in this column over a 3 issue period starting next issue. Anyone who would like the complete summary which is quite detailed and covers in very minute detail all of the knowledge learned from the flight of OSCAR 6, can send 25¢ plus a SASE to me at the above address.

OSCAR 6 is a great achievement for the world of radio and radio amateurs in particular. It has shown that amateurs *are* dedicated and they *can* get together and combine their knowledge and produce something that has achieved success. OSCAR 6 has shown that the amateur community is not disgruntled and not ready to give into the ever growing idea that amateurs just sit around and take up the airwaves with useless gab. I hope that this satellite has shown those amateurs who are thinking of letting their licenses expire because they feel that nobody has any desire to join the amateur ranks, or feels that nothing is 'happening' in the amateur bands. Amateurs *are* doing something.

The only way we are going to make any action happen is to cause it ourselves. Get involved, like the members of AMSAT have in producing OSCAR 6 which has not only benefited us but has been useful in classroom education and has opened the eyes of a lot of people who two years ago probably didn't know *amateur* radio existed !

A-O-B STATUS

As of December 31, 1973, AMSAT-OSCAR-B (A-O-B) appears to be about two months behind schedule. The status system-by-system is as follows:

A) Wiring harness — Completed on schedule (Nov. 1).

B) Two-to-ten meter repeater — Completed, checked out, and now in burn-in.

C) Canadian 435.1 MHz beacon — Completed, delivered, and undergoing tests for possible minor modifications.

D) Sensor board, experiment control logic (ECL), and instrumentation switching regulator — All are completed, except the ECL, which is undergoing modifications to ensure against the transient switching encountered with OSCAR 6.

E) 2304.1 MHz beacon — Nearing completion by the San Bernardino Microwave Society. Delivery expected from California in the next few weeks. Quadrifilar antenna is being fabricated at APL and RCA. It should be available in the next month after pattern measurements at RCA.

F) 70cm-to-2m repeater — Delivered by DJ4ZC in February 1973 and still in storage.

G) Battery charge regulators and 28-volt power regulators — Shipment from AMSAT-Deutschland has been delayed to allow further testing and is now expected soon.

H) Teletype telemetry encoder — Completed and delivered by WIA-Project Australis and now checked out.

I) Morse code telemetry encoder — Completed and checked out.

J) Spacecraft structure — Fabricated and now being assembled.

K) Solar panels, brackets for array diodes — Completed, but wiring (including RFI filters) remains to be done.

L) Battery — Completed, but a leak has developed in one cell and is being checked out.

M) Antennas — Ten-meter antenna deployment mechanism is still under development. Combined 2m/70cm antenna has been designed along with the diplexer/ filter, but remains to be fabricated and tested by AMSAT-Deutschland in Germany.

N) Delta launch vehicle interface hardware — Fabrication of conical interface fitting (by AMSAT) is still required. McDonnell-Douglas, launch vehicle contractor, is now beginning fabrication of the Delta attach hardware.

O) Command decoders — One unit has been completed and checked out. The second redundant unit is completed but not yet fully working.

P) Two-meter bandpass filter (for two-to-ten meter repeater) — Wideband Engineering is reworking one of the filters they shipped to us and delivery is hoped for next month. VE3QB has volunteered to fabricate a backup filter for delivery in a short time frame if needed.

Q) Thermal design — NASA-Goddard has been assisting with thermal design, and they are currently refining the calculations. They have come up with a reasonable explanation for the unexpected thermal behavior of OSCAR 6, and we are now confident that the OSCAR 6 overheating problem won't reoccur with OSCAR 7.

R) Codestore — The last of the COS/MOS integrated circuits donated by RCA have now been received, and Codestore is now completed and checked out.

S) Stabilization system — The stabilization magnets have been received and their properties are now being measured. The permalloy hysteresis damping rods have been cut and annealed.

TIME SCHEDULE

With the successful launch of the ITOS-F satellite by NASA on November 6, 1973, it is now expected that ITOS-G, the mission we expect OSCAR 7 to fly on, will probably not be called up for launch until around July 1974.

Originally, it was expected that a launch opportunity for OSCAR 7 would exist around the beginning of 1974. The loss of ITOS-E during launch on July 16, 1973, caused a reshuffling of the launch schedule, with the result that we find ourselves with several months available for additional spacecraft testing.

Orbital Information

Orbit	Date (Apr)	Time (GMT)	Longitude of Eq. Crossing °W
6666	1	0023.4	53.6
6679	2	0118.3	67.3
6691	3	0018.2	52.3
6704	4	0113.2	66.0
6716	5	0013.1	51.0
6729	6	0108.0	64.7
6741	7	0008.0	49.7
6754	8	0102.9	63.5
6766	9	0002.8	48.5
6779	10	0057.7	62.2
6792	11	0152.7	75.9
6804	12	0052.6	60.9
6817	13	0147.5	74.6
6829	14	0047.5	74.6
6829	14	0047.5	59.6
6842	15	0142.4	73.4
6854	16	0042.3	58.3
6867	17	0137.3	72.1
6879	18	0037.2	57.1
6892	19	0132.1	70.8
6904	20	0032.1	55.8
6917	21	0127.0	69.5
6929	22	0026.9	54.5
6942	23	0121.9	68.2
6954	24	0021.8	53.2
6967	25	0116.7	66.9
6979	26	0016.7	51.9
6992	27	0111.6	65.7
7004	28	0011.5	50.6
7017	29	0106.4	64.4
7029	30	0006.4	49.4

WB8LPB

SOCIAL EVENTS

HAMBOREE

The greater Baltimore Hamboree will be held at Calvert Hall College, Putty Hill and Goucher Boulevard, Towson MD (one mile south of Exit 28 on Beltway I-695), on Sunday, April 7, 1974, at 10 AM. Food service, flea market, prizes. Registration $2. No table or percentage charges. For more information contact: Joe Lochte, 5400 Roland Ave., Baltimore MD 21210, or Brother Gerald Malseed, 8102 La Salle Avenue, Towson MD 21204.

P.H D.

The P.H.D. Amateur Radio Association invites you to attend its Fifth Annual North West Missouri Hamfest in Kansas City MO on Sunday May 5, from 9AM to 4:30PM. The location will be in the Kansas City North Community Center, one mile south of the Antioch Road, Highway I and I-35 Interchange. Address is 3930 No. Antioch Road.

FRIENDLY FESTS

Hamfest! Indiana's friendliest and largest Spring Hamfest. Wabash County ARC's 6th Annual Hamfest, May 19, 1974, 4-H Fairgrounds, rain or shine. Admission still only $1 for advanced tickets ($1.50 at gate). Large flea market, technical sessions, bingo for XYL's, free overnight camping, plenty of parking. Bonus for car-pools (4 or more adults per car). For more information or advanced tickets write: Jerry Clevenger WA9ZHU, Route 4, Wabash IN 46992.

DEKALB KOUNTY

The DeKalb County amateurs are sponsoring a Hamfest on May 5, from 7AM to 4PM at Notre Dame High School, 3 miles south of DeKalb off Route 23. Signs will be posted. Registration is $1.50 in advance, $2 at the door. For more information contact: Crawfords Electronics, 301 Main St., Genoa IL 60135.

KENTUCKY HAM-O-RAMA

The Northern Kentucky ARC Ham-O-Rama will be held Sunday May 26, 1974 at Boone County Fairgrounds, Burlington KY, from 8AM to 5PM, 10 minutes south of Cincinnati OH on I-75. Features prizes, indoor exhibits, forums, flea market, food. Tickets $1.50 advance, $2 at the door. For tickets and details write: W4PII, 601 Rosemont Ave., Covington KY 41011.

DAYTON HAMVENTION

The expanded Dayton Hamvention will be held this year on April 26, 27 and 28 at HARA Arena and Convention Center. Open House on Friday to exhibits with technical sessions to run on Saturday and Sunday. Included are: DX, ARRL, VHF, FM, RTTY, MARS, Antenna, Space-Com., Transmitter Hunts, Ladies Programs and others. Giant Flea Market for 2 days. Free bus service from downtown Dayton via motels and hotels. Free parking at the Arena with self-contained trailors and camper units permitted to park in designated area overnight. Saturday banquet at 7PM with Senator Barry Goldwater K7UGA, as guest speaker. Registration in advance is $2.50 and S3 at the door; Banquet is $4.50. Advance registration closes April 25. For additional information write for program and map to Dayton Hamvention, P.O. Box 44, Dayton OH 45401.

ERIE HAMFEST

The Erie Amateur Radio Society will hold their semi-annual Amateur Equipment Auction on Sunday Afternoon May 5, at 1PM, at Laborers' Union Hall, 1205 West Perkins Avenue, Sandusky OH. Refreshments, cash prizes, door prizes. Talk-in on 94/94 and 52/52.

MESILLA BEAN FEED

The Mesilla Valley Radio Club of Las Cruces, New Mexico, cordially invites you to its "Annual Bean Feed and Swap Meet," to be held April 28, 1974, at La Mesa Park. Prizes/Food/Beverages/Family Fun. Information on 16/76 and 3940 MHz. For more information contact Whitey W5ECO.

MISSOURI SINGLES

The Missouri Single Side Band Net will have their annual picnic at Memorial Park in Jefferson City MO, Sunday June 9. A covered dish dinner will be served at 12:30. Coffee, ice tea and soft drinks will be provided by the net. Door prizes given. All amateurs, their families and friends are invited.

CENTRAL MASS AUCTION

The Central Massachusetts Amateur Radio Associations annual auction is April 20, at the Knights of Columbus Hall, Rt. 9, Spencer MA, beginning at 1:00 PM Talk-in on .94 and 37/97. For further information write: WA1FIH/1, 1622 Worcester Rd., Apt. 421B, Framingham MA 01701.

ROCK RIVER HAMS

The Rock River Radio Club of Dixon IL announces their 8th annual Hamfest on April 28, at the Lee County 4-H Fairgrounds, one mile east of the junction of US 30 and IL 52, in Amboy IL. Tickets $1.50 in advance, $2 at the gate. Talk-in on .94.

SEE YOU IN DES MOINES

The Des Moines Radio Amateur Association invites you to participate in the Des Moines Hawkeye Hamfest at the Iowa State Fairgrounds in Des Moines, Sunday, June 16, 1974, 8:00 AM to 6:00 PM CDT. Booths available for rental. For further information contact: Alan V. Harris, KØOOD, P.O. Box 88, Des Moines IA 50301.

ROCKY ARRL FEST

The 1974 ARRL Rocky Mountain Regional Convention will be held June 7, 8, and and 9, at the Ramada Inn in Pueblo CO. Pre-registration fee is $6, at the door $7. Meals, accomodations and camper/trailer hook-ups will be available for the three days of the convention at special reduced rates. Sunday afternoon banquet with speakers from Industry and the Amateur Radio Field. For additional information write: Convention Committee, P. O. Box 92, Pueblo CO 81002.

HUMBOLDT HUMBOLDT

The annual Humboldt ARC Hamfest is Sunday May 19, at Shady Acres City Park, Trenton TN. Flea market, ladies activities and a playground for the children. For information contact Hugh Wardlaw WB4SLI, 2678 Cole Drive, Humboldt TN 38343.

BLUE RIDGE

The Blue Ridge Radio Society of Greenville SC will hold its annual Hamfest on May 5, at the Recreation Building in Cleveland Park, Greenville SC. Flea market, prizes, fun from 9AM til 3PM. For information contact Don Rose W4ZKH, 11 Ivanhoe Circle, Greenville SC 29607.

IRVINGTON HAMFEST

The Irvington Radio Amateur Club will hold it's annual hamfest on Sunday May 19, 1974, 1-6 PM, at the Irvington PAL Building, 285 Union Ave., Irvington NJ. Admission – 50¢ in advance, $1 at the door. Table rental – $2.50. Refreshments will be available. Door prizeII For more information and advance tickets contact WA2PWZ, 9 Barbara St., Newark NJ 07105.

MOULTRIE KLUB

The Moultrie Amateur Radio Klub will hold its 13th Annual Hamfest April 28, 1974 in Wyman Park, Sullivan IL. Indoor – Outdoor Market. Ticket donation $1 in advance – $1.50 at the door. For information write M.A.R.K. Inc., P.O. Box 327, Mattoon IL 61938.

WALTHAM AUCTION

The Waltham Amateur Radio Association will hold their annual auction April 6 at 1:00 PM at the Kennedy Memorial Junior High School, Lexington St., Waltham MA. Talk-in 04/64 and 52.

DX FOOTNOTES

By: Gus M. Browning, W4BPD
Drawer "DX"
Cordova, SC 29039

According to the latest I can find out the sun spots have not got to the bottom of the eleven year cycle. Even though the sun spots are not "with us" plenty of good DX still seems to come through, but you have to be on when it's coming through. Many DX'ers seem to think that DX should come through at hours that's convenient to them, never thinking about hours that is convenient to DX station they want to work. If I was chasing those rare ones I would first try to place myself in their shoes and more or less assume that the DX station probably gets off from their work at 5 P.M. (the DX stations time) and that it probably takes him one hour to get home from his job, another 30 minutes to "freshen up" and get the rig on the air. After trying this time for a number of days I would then more or less assume that the DX station comes home, freshen ups, mows his lawn, do a few more chores around the house for his XYL (or himself), then gets on the air. Another way it may be with the DX station is that he does all the above and then has his dinner and then gets on the air. I would try to figure out the various possibilities of his hours of operation and hunt for him at those hours. Then when you work someone in his part of the world I would do a lot of "inquiring" as to what times that they have maybe heard or worked the fellow you need. Of course, inquiring what band, mode, etc. the fellow uses or seems to like best. You can get a lot of good DX info on the rare ones from fellows in nearby countries. If you can get real, "buddy, buddy" with a few of the DX chasers overseas they can fix you up with a few schedules with the fellow you need for that "new country" you always seem to "miss"! Working DX is no problem if you are on the air when he is and even easier when you have things "fixed up". Try it, it WILL WORK and and save you from being "stomped to death" in the big pile-up.

Do you know that you can check if ten meters are open by listening for these beacon stations:
DLØAR on 29000 kHz
GB3SX on 28185 kHz
VE3TEN on 28175 kHz
VP9BA on 28165 kHz
and 3B8MS on 28190 (that's over in Mauritius you know)

You might try these and see what's coming through.

MELLISH REEF CARDS are to start counting towards DXCC on April 1, 1974. They now have been approved by the ARRL.

NEW PREFIX FOR PAPUA AND NEW GUINEA: It's just P2 from now on. The P2 takes place of the VK in their calls. VK9XYZ would become P29XYZ with their new prefix of P2. Good news for WPX boys.

VQ9HCS on Astove Island (counts same as Seychelles) is active and will be there until about June 1975. He was not too active a few months ago, but had hopes that he could get more gasoline soon, hope he has plenty by now. Name is Harry and the rumor that he has an orchestra composed of fiddler crabs, squaking Boobie Birds, whooping cranes and turtles are now true according to Robbie, 5Z4ERR of Nairobi, Kenya (lion Country, you know). Knowing Robbie like I do I know he probably works Harry every day about 30 minutes BEFORE the band opens to "W/K land"! He used to work me when was all over the Indian Ocean and brother you "hear" 5Z4ERR down there!

Thank goodness winter has left and antenna putting up weather is again with us, and this year you had better "get with it" right away or you (if you are like me) will be still using that darn helf-wave all next winter. This summer I am going to at least "try". It's so easy to say I will start "next week" and then it's again winter time and another year is "shot".

I always say it's not the world that is wrong - it's YOU! You gotta "get with it" Ole Buddy or you are lost in the storm. Those little IC's are here to stay and you had better be trying to learn all about them that you can or you are going to be "lost" in the future years. As for myself, I am right "in there" building up stuff with them like mad. You can put a lotta stuff in very small spaces, too. and they WORK and HOW!

IF you are going to Okinawa I suggest that you first write to 5AF/DCO—AMRS, APO San Francisco 96525 telling him your story and after hearing from him and only then would I pack up my gear. It seems that you can only get a license if you are actually living on US military bases, and houses on these bases are as scarce as "hen's teeth".

WANNA REPORT NON-AMATEUR QRM in our bands? Just jot-down this telephone number on front of your receiver: (202) 632-6975 that is the phone number of the FCC Monitoring Watch and you can phone them anytime, day or night.

HAVE YOU BEEN USING AMSTAT? If so, how about sending them a full report. They have a questionnaire thay will send you and also a data sheet. Address very short: Box 27, Washington, D.C. 20044

DX'ERS ARE THE ELETE OF ALL HAMS! That's right, we spend much more money on our gear, about 5 to 10 times as much as the "run of the mill" ham (big beams cost more than ½ wave dipoles), multi rigs cost more than single ones, big rigs cost more than small ones, we spend more money with the electric company (the electric meter turns faster with big rigs, you know), we put up our antennas much higher than most others and towers (tall ones) cost much more than telescoping TV masts, and on top of that we are usually better fellows (except when there is a big, fat, pile-up) then it's dawg eat dawg! Now hold your head up a little higher fellow DX'ERS! hi. Life is a bowl of cherries and I am eating mine and enjoying every little minute of it. I am dumb enough to just "keep smiling" all the time" Why not do the same and MAKE EVERYONE "HAPPY"?

NEED EITHER MONACO (3A2) OR SYRIA? Keep in mind that most all stations worked in Monaco are screened by mountains, and the same goes for stations operating from the city of Damiscus, Syria. You might more or less expect your best chance of a QSO is when the bands are open via the long path. Otherwise you might expect their signals to be on the weak side if the path is the short one. When you are practically right up against a mountain that's between you and who you want to work.

Guess that's it for this month,

> HB9J, Jean Lips, the well known European DX'er passed away in late December. His well known signal will be missed in the pile-ups by all of us. I am sure he deserves all the various honors that the DX world had bestowed upon him. I personally met Jean in Europe a few times and he impressed me as a very fine gentleman and scholar. We all pass our condolences to his fine family.

WANNA WORK XU1AA? You might rey talking to "The Pot", Gud Ole Bill, W7PHO who skeds them now and then. Bill "might" help you arrange "something" with the boys at XU1AA, but, don't try to rush him, kinda "sneak up on him"! Guess this covers the situation for now CU next month, Gus BPD

Joe Everhart WA3VHX
Lynnebrook Apts. 18D
Millersville PA 17551

A DELAYED VOX FOR REPEATERS

This device could help bring order to your repeater and also aid you in fulfilling your logging requirements.

While eating lunch at a local hamburger stand a few of us associated with the Lancaster repeater were mulling over a problem we'd experienced. Though usually the machine is pretty quiet, there are times when the repeater is ker-chunked for no logical reason. (For those who may not know, kerchunking is keying up a repeater with a short, unidentified carrier, and just letting it drop). Most often it is due to locals with itchy mike button hands or far-off repeater users who are using another machine though bursts of carrier reach our mountain-top site.

Finally, we want our repeated signals to have call sign identification on our tape for logging purposes.

From our viewpoint, this is at very least annoying. It makes for wear and tear on both our equipment and on our ears. The FCC, too, requires:

a) Transmissions be identified by call signs
b) No retransmission of signals unless desired by the originating station.

So, we kicked around various means of fulfilling the above goals. Several methods of limiting repeater keyup to intentional users are in common use. Two of these involve the transmission of audio tones.

PL (a Motorola trademark) is the common name for continuous transmission of a precise "sub-audible" tone below 300 Hz. A repeater equipped for PL use will not respond to any received signal without the proper tone. Also used is the "tone burst" system, which requires the transmission of a short burst of audio tone at the beginning of each transmission. Further information on these two systems is given in the FM Repeater Circuits Manual" available from 73 Magazine. Both schemes were rejected since they discriminate against the casual repeater user or transient who does not have either the proper equipment or knowledge of frequencies necessary. Then, too, their use is no insurance against unidentified transmissions.

A simpler method was possible, as used on the Philadelphia 16-76 machine. This is the use of a timer which requires three

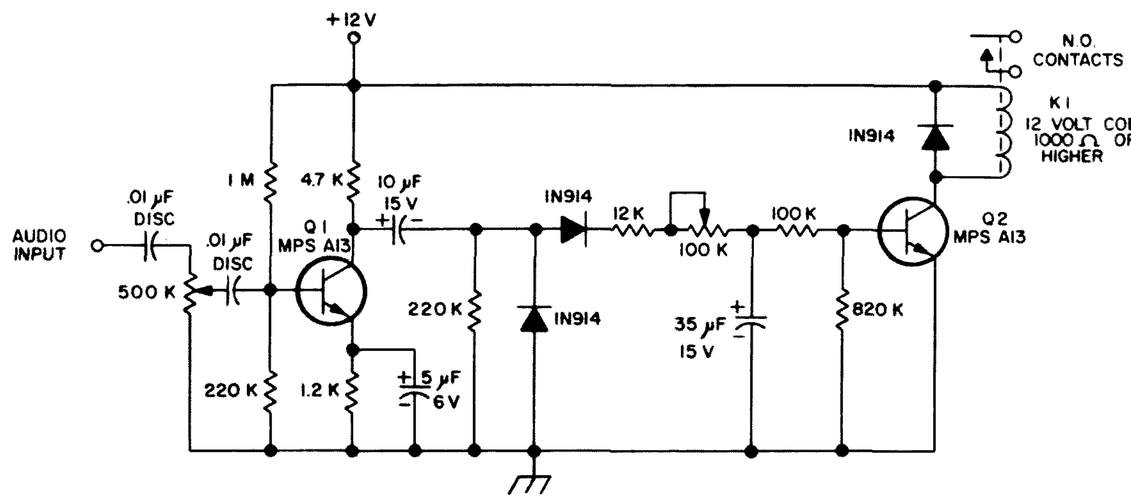

Fig. 1. Schematic diagram of the delayed VOX.

seconds of continuous carrier on the input receiver to turn on the transmitter. After the initial turn on delay, the repeater is controlled by its COR until a 20 second lapse in transmission occurs. After this, the system requires another three second carrier to return to normal operation. Though this method is simple to use, it still does not guarantee that the user will identify himself.

The scheme we came up with is a timer with a little more sophistication in the form of a voice-operated relay. To key up the machine, both carrier and audio must be present for a preset period of time. Hopefully, the station desiring to use the machine will identify himself, thus providing the necessary audio. The circuit then has a long enough turn-off delay to allow normal repeater use.

Circuit Description

Fig. 1, is the circuit schematic. In the interest of simplicity both transistors shown are really darlington transistors. Though they come in the same package as a regular plastic transistor, they are two cascaded NPN transistors on the same silicon chip. With their higher gain and input impedance, they make the two transistors do the job of four. Q1 is a simple common emitter amplifier whose over-all gain is adjustable with the 500K input potentiometer. It supplies a high ac gain and high input impedance. The input coupling capacitors were chosen to minimize low frequency ac (below 300Hz) response to make the circuit less sensitive to hum or PL tones.

Audio peaks from Q1 are coupled to a full-wave detector through the 10μF electrolytic capacitor. The series resistance to the 35μF electrolytic controls its charge-up time to delay relay pickup. By adjusting the 100K potentiometer turn-on delay is adjustable from a fraction of a second to about four seconds.

The resulting dc is applied to the relay driver Q2 through a resistive divider. These two resistance values were chosen for a relay drop-out delay of about 15-20 seconds. In operation, the 35μF capacitor is kept charged after the turn-on delay by repeater audio. The long turn-off delay is required to keep the VOX circuit from dropping out the repeater during lapses in speech or while letting the COR drop out to reset the repeater timer. The relay contacts are used for repeater control.

Construction

Because the circuit operates at audio, layout and construction are very non-critical All parts were mounted on a 8x8 cm piece of perforated board and hand wired.

The parts, too, are pretty much run of the mill. Transistors Q1 and Q2 are Motorola MPS-A13, but other darlington pairs such as the Motorola HEP S9100 or GE 2N5306 may be substituted. Alternatively, those without a well-stocked junkbox may make their own darlingtons as in Fig. 2. Ten percent

quarter-watt resistors were used throughout, but the values are not sacred. You can try substituting what you have, just be sure that the VOX operates. The electrolytic capacitors were junk box units selected for low leakage (a few microamps). I used a fancy printed circuit mount relay for K1, but any relay with a 1000 ohm or higher 12 volt coil such as the CALECTRO D1-967 or Radio Shack 275-003 will work just as well.

Installation and Adjustment

The input impedance is quite high so receiver audio can be obtained from any point with a few hundred millivolts of audio. We had plenty of audio across the 8 ohm loudspeaker of the receiver loudspeaker used for local monitoring. The 12 volt dc supply must be fairly clean but should be easy to find since less than 20mA is required. Naturally, the VOX should be shielded from the repeater transmitter rf. The normally open relay contacts are wired in series with the COR as in Fig. 3.

Adjust the 500K input potentiometer for full swing (about 10V peak to peak) at the

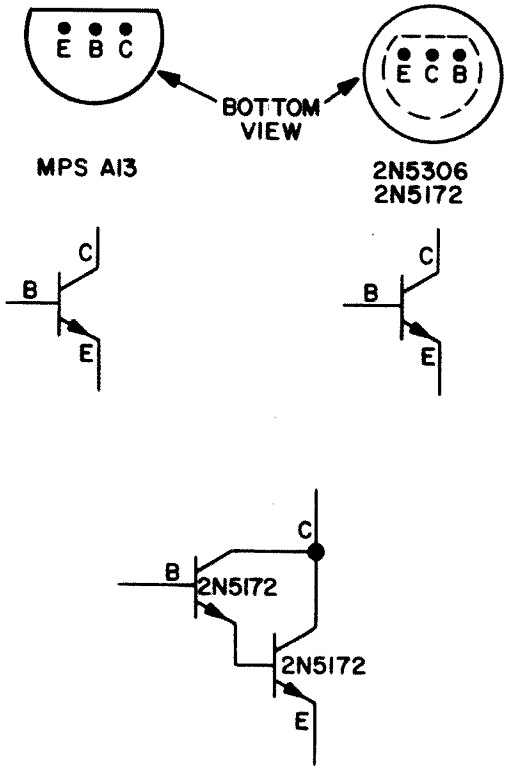

Fig. 2. Transistor connections. Two 2N5172 or other NPN silicon transistors with a gain of 100 or more can be used in place of MPSA13 when connected as shown.

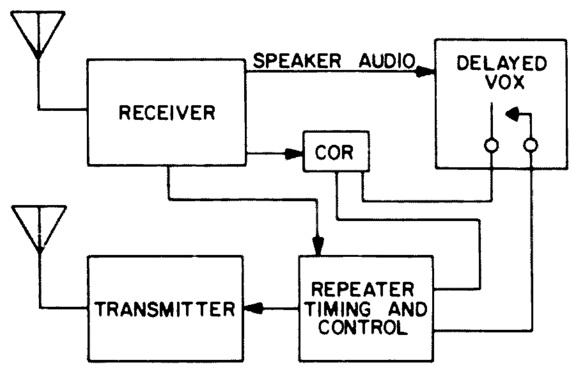

Fig. 3. Connection of the delayed VOX between the COR and repeater control circuits.

collector of Q1 with normal repeater input audio. Then tweak the 100K timing pot so that the relay does not pickup until audio is present for the desired length of time. To insure a fresh start up, momentarily short the 35 microfarad timing capacitor before applying audio to set the timing. Hang on delay is fixed at about 15 to 20 seconds once the relay has been actuated.

Our VOX board was adjusted to delay repeater pick-up until an average voice recited the repeater call letters WA3KXF through the input receiver, with somewhat less than full deviation.

Remarks

We spent several weeks trying to educate users to operate the new system. A suggested turn-on identification goes like this: "WA3KXF this is WA3VXH mobile three." The repeater automatically identifies itself and the repeater should be activated by the time the operator identifies himself. Thus the identification criterion is satisfied.

This mode of operation has been well accepted by the local group. With the incentive it provides to identify, everybody becomes conscious of proper usage procedures. A few persist in trying to defeat the system, but you can't stop somebody who has the guts for a three second belch. The delayed VOX is not, of course, a cure-all, but our repeater has been much more orderly since its installation.

This article would not be complete without thanks to Bob K3VAX and Allan K3HQC for the VOX timer concept and prodding to write this article.

. . . *WA3VXH/3*

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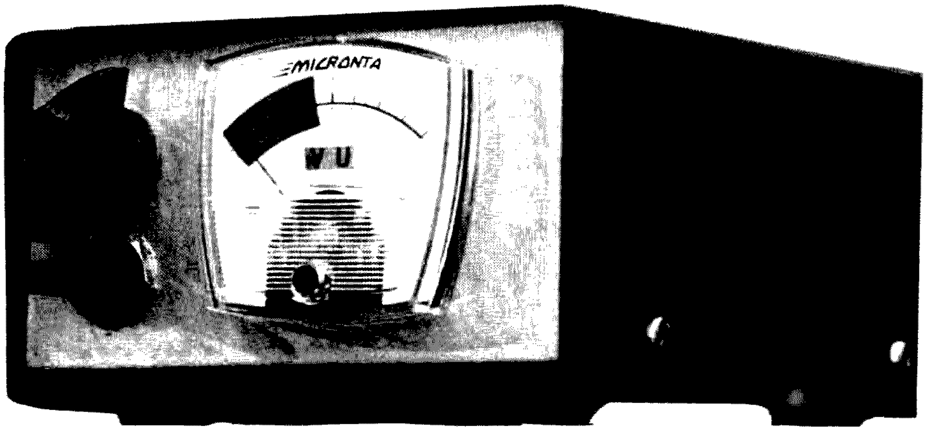
THE F.M. "AUTO-START"



Refer to section 97.91 of the Amateur Rules and Regulations for the proper usage of one-way communication.

There is a rumor going around in repeater circles to the effect that any ham worth his license should continually monitor the local repeater. It's a nice thought, but unless you're a control station and *have* to listen, continuous monitoring is inconvenient, if not downright impossible. After all, most of us have to eat, sleep and (sigh) work, not to mention quite a few other things. This inability to monitor continuously is annoying; if you want to send a message to W1XXX, it's a sure bet that W1XXX will be in the bath-tub or some other equally inaccessible place (this is a corollary of O'Brien's Law, which, simply stated, says "Murphy was an optimist."). What to do? The solution, I've found, is an inexpensive ($10-$15) device which I call the FM Auto-start.

The auto-start concept is simple. Suppose you want to send a message to a buddy of yours; after giving him a few calls with no reply, you key an audio encoder on your transmitter, which turns on a tape recorder attached to your friend's receiver. The tape recorder remains on for about thirty seconds or so, allowing you to transmit a short message, which in turn is recorded. Not only is it a useful gadget, but it's a lot of fun, as well.

The Circuit

The auto-start is built around the Signetics[1] 567 tone decoder, which has got to be the greatest invention since stretch socks. The receiver audio output is attenuated and fed to pin 3. Whenever a tone of the proper frequency makes its way into the I.C., pin 8 goes low. The decoder frequency is determined by R_3, R_4, and C_2; in the con-

figuration shown in the schematic, the frequency is equal to $1.1/(R_3 + 2{,}500)C_2$ with R_3 in ohms and C_2 in farads. This formula assumes that the 5K trimmer is set mid-way The values shown in the schematic are for a frequency of approximately 1kHz. Should you decide to select another frequency, be sure to make $(R_3 + R_4)$ fall between 1kΩ and 20 kΩ. Bandwidth is determined by C_3. The value shown gives a bandwidth of approximately 10% for an input frequency of 1kHz. The bandwidth may be decreased

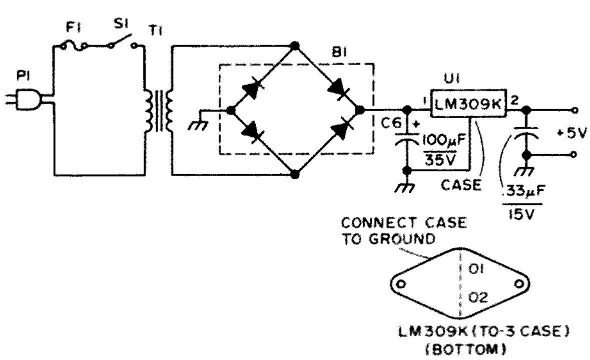


Fig. 1.

by using a larger value of C_3, but I've found the 10% bandwidth to be sufficiently selective to avoid false starting. For those more adventurous souls who wish to experiment, the formula for the bandwidth is

$$\%\,BW = 1070\sqrt{\frac{V}{f.C_3}} \quad \text{where } V = 200\text{ m V}$$

where C_3 is in μF, f is the decoder frequency in Hz., and V is the input voltage in millivolts.

R_6 and C_5, along with a 741 operational amplifier, form a timer. When pin 8 of the 567 goes low, C_5 discharges through R_5, thereby lowering the voltage on the 741's inverting input. As long as the inverting input's voltage remains below the non-inverting input's voltage, the 741's output remains high, pulling Q_1 into conduction, which in turn pulls the relay. The normally open relay terminals close, turning on the tape recorder—just how they do this will be explained a little later on. Once C_5's voltage goes above 2.2 volts, the approximate voltage on the non-inverting input, the op amp output goes low, and the relay opens up, turning off the tape recorder. With the values of R_6 and C_5 shown, the timing period is about thirty seconds long. To increase or decrease the length of the timing period, raise or lower the value of R_6.

Little need be said about the power supply; if you use an alternate source, however, be sure it's well-regulated, as the 567 can get a bad case of the "funnies" with a poor power supply.

Construction

The circuit, as one might expect, is not critical and may be constructed to meet the aesthetics of the builder. I built mine on Vector board with holes spaced the spacing of DIP I.C. pins, so drilling the board is eliminated.

In the way of a chassis, Radio Shack puts out a line of "deluxe" cabinets at reasonable prices, in case you're tired of chassis that look like they're made out of surplus aluminum siding.

The Tape Recorder

When I started out to build this project, I vowed not to deface my tape recorder. Happily, no modification was necessary, and there's a good chance that you won't have to deface yours, either.

Most small recorders, both cassette and reel-to-reel, have a sub-miniature phone jack labeled "remote." In normal use, a small SPST switch on the microphone is connected to the jack, allowing the operator to turn the recorder on and off while holding the mike. When the input to the jack is a short, the tape recorder is turned on, and when the jack's input is open, the tape recorder quits. If your tape recorder has such a jack, you're in luck; just take P_2 and plug it into the remote jack. If your tape recorder has no such jack, the best bet is to sever one of the wires going to the capstan (the little shaft that rides against the rubber idler wheel) motor and attach each end to the normally open contacts of K1.

Before using the auto-start, you'll have to buld audio encoders for all the people from whom you wish to receive messages; fortunately, this poses no problem. *73* has published numerous articles in past

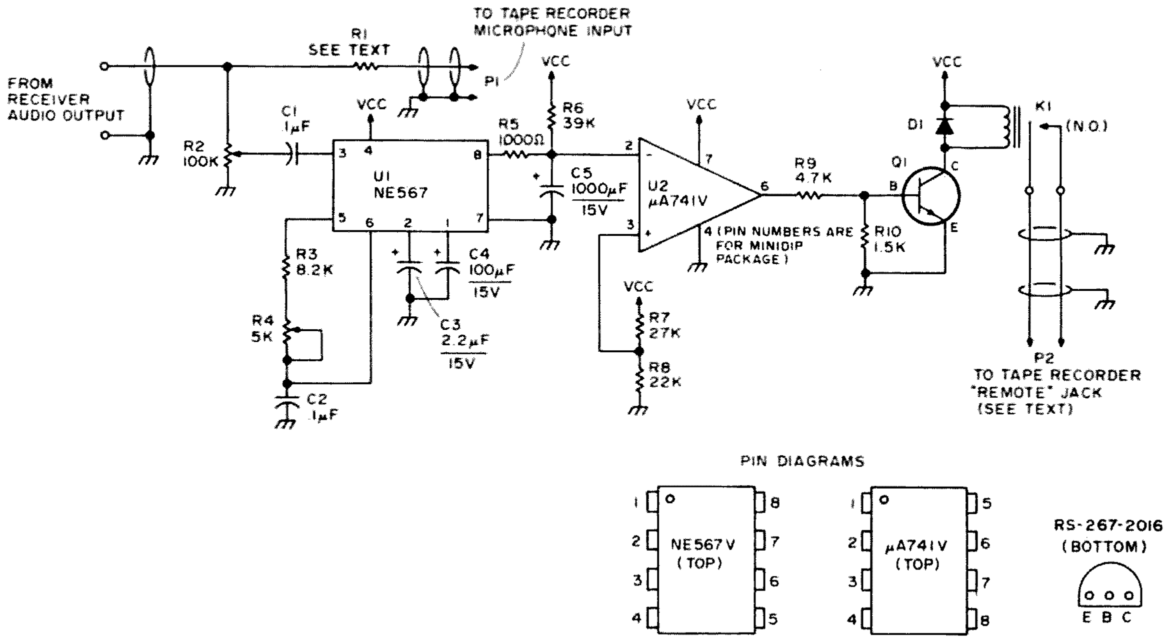


Fig. 2.

issues2,3,4, and as long as the encoder you choose is relatively stable, things will be smooth sailing.

After assembling the encoders, measure the frequency of the 567 by feeding the output of pin 5, a square wave, into an oscilloscope or frequency counter. Next, tweak the encoders until their frequencies are reasonably close to that of the 567.

Now the real test: have a buddy hook up an encoder to his transmitter, and attach the auto-start input across your receiver's speaker terminals (the speaker should be left connected). Have your friend key the encoder in cycles of three seconds on (about the time needed to totally discharge C_5) and ten seconds off. Adjust R_2 until the encoder just barely triggers the auto-start, and leave it at that position, or slightly higher. If the auto-start doesn't trigger, it may be necessary to (a.) turn up the receiver's audio gain, or (b.) adjust R_4 slightly.

After you have the auto-start working nicely, plug P_1 and P_2 into your tape recorder, and set it in the *record* position. Since P_1 feeds the audio output of the receiver directly into the mike input of the tape recorder, it will be necessary to attenuate the signal with R_1, starting with about 220kΩ and working *down*, so as not to blow the recorder input to bits on the first try. My recorder, an old Lafayette cassette, works nicely with R_1 equal to 27kΩ.

A word of caution: Any formal message transmitted into the auto-start must be treated as any other piece of traffic, i.e., it must be kept on file.

Once you have your system working, the possibilities are endless. I use mine to leave messages at home while commuting to and from school—it's a real boon on those days when I encounter poor traffic conditions and want to leave a message that I'll be late getting home. Often the system is handy for recording another fellow's signal if his audio goes sour, so that he can get some idea of his problem's nature (how often have you tried to explain to a fellow ham just what his ailing transmitter sounds like?). But best of all, when I explain just how the system works, hams and non-hams alike are intrigued, which is nice.

. . . *WB2VRW*

REFERENCES:

1. 811 East Arques Avenue, Sunnyvale, California 94086.
2. "Squeaker for Tone Burst Entry," *73*, August, 1973, pp. 27-30.
3. "The MOS-Tone Encoder," *73*, December, 1972, pp. 29-31.
4. "Customized AFSK-MCW and Code Practice Oscillator," *73*, April, 1972, p. 36.

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THE NEW BREED ON 2 METER FM

The following is a true story. Only the names have been changed to protect the guilty. The story is about my old friend, Mac. Mac has been in the two-way service business for over fifteen years. His ham license and commercial 1st Telephone and 2nd Telegraph tickets go back even farther. In case you didn't know, a two-way service business is no gold mine. Mac words hard and long to feed his large family.

One day a well-dressed fellow walks in his shop, introduces himself as Frank, a Technician class ham, and asks Mac to install his new 13-channel 2 meter Hashifisti in his Cadillac. Mac quotes the regular price for a two-way commercial installation and the guy doesn't bat an eyelash. "OK," says the obviously well-heeled Frank, "But don't drill any holes in the roof." At which point he brings out one of those fancy CB-type no-hole trunk lid mounts that go on the rear deck. Mac thought of his No. 6 kid needing shoes, No. 2 kid needing braces for his teeth, etc., so he only shrugs and says, "Just as you say."

After the job was finished, Frank paid Mac – in cash. As Mac pocketed the money his curiosity got the better of him. "By the way," he asked, "How come I haven't seen you around the radio club?" "Just moved into town last week," Frank answered. "Used to live in Center City. Was on CB there. Joe Blue gave me the Technician exam. Do you know him? Mac said, "Just slightly," but under his breath he said to himself, "Holy cow! That crook! He'll do anything for a buck."

A few days later Mac crawled out from under a car as one of those foreign sports cars roared up the drive to his shop. Out stepped a young man in brightly colored flared slacks. "I'm Bruce," he announced, "A friend of Frank." Mac didn't reply, as he slowly wiped the grease from his hands. "I'm interested in getting one of those 2 meter FM sets so I can use the repeater to talk with Frank." Mac still didn't say anything. "Frank says you can give me that Technician exam, like Joe Blue did for him in Center City." Mac's eyes narrowed at the mention of Joe Blue. "How is your code?", asked Mac. "Oh, I've got it pretty well memorized, except I get a bit mixed up on A and N," said Bruce. "Well, I haven't got time now to set up the code practice oscillator to give you the test," Mac said curtly. "Shucks," Bruce says, "Frank said you would take my word on knowing the code and you would fill out the exam papers for me if I made it worth your while." Bruce then pulled out a roll of bills and started peeling off twenties. He was so busy with the money he didn't notice the change in Mac's color, which had gone from white to red to purple.

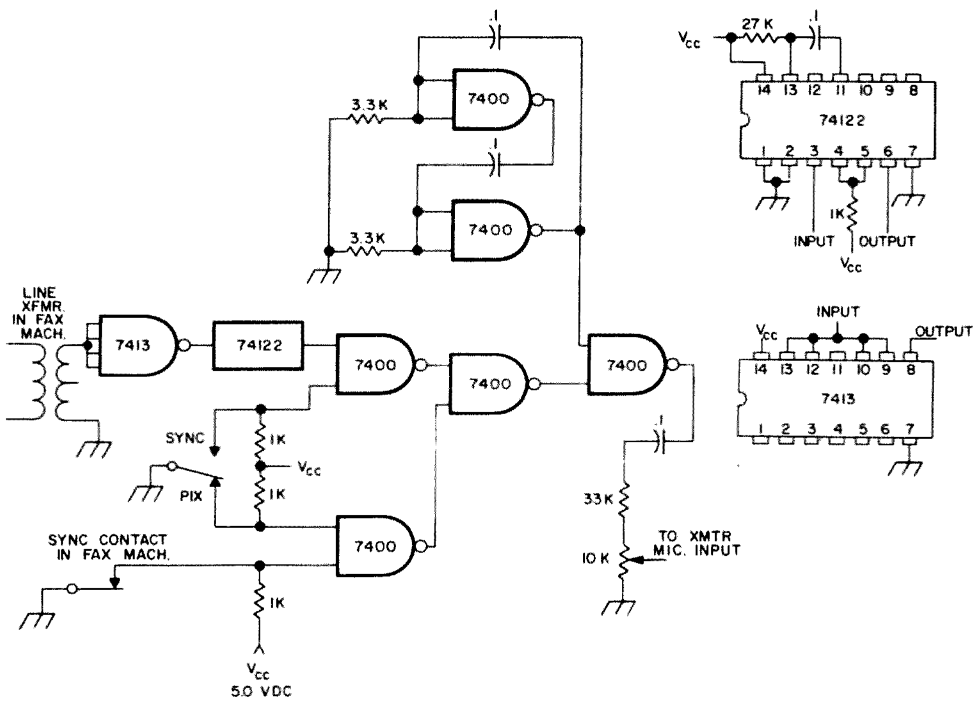
Mac, who is a very large guy, carefully folded up the bills Bruce handed him, shoved them into the breast pocket of Bruce's flowered shirt without saying a word, then spun him around, grabbed him by the seat of the pants with one hand and the shirt collar by the other, propelled him swiftly through the door and threw him right into the seat of his sports car – without bothering to open the car door. Mac then went back into the shop, closing the door gently. He went straight to the refrigerator, pulled out a beer and silently opened it. Jack, who works for Mac, had observed the whole thing. He didn't say a word either but noted that Mac's color was slowly returning to normal. Later in the day Mac said laconically to Jack, "Two meter FM has sure gone to hell."

. . .K2PMM/DL4

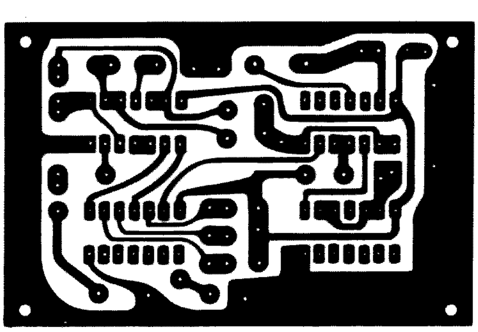
CIRCUITS, CIRCUITS, CIRCUITS...

The following circuits have appeared in the referenced books, magazines, application notes, etc. While we try to reproduce all of the information that should be needed by an experienced constructor, readers may want to avail themselves of the original sources for peace of mind.

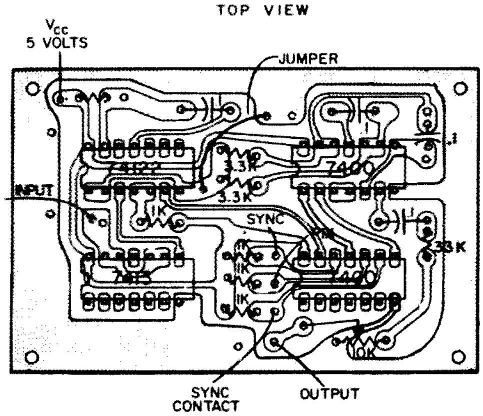
Readers are requested to pass along any interesting circuits that they discover in sources other than U.S. ham magazines. Circuits should be oriented toward amateur radio and experimentation rather than industrial or computer technology. Submit circuit with all parts values on it, a very brief explanation of the circuit and any additional parts information required, give the source and a note of permission to reprint from the copyright holder, if any, and the reward for a published circuit will be a choice of a 73 book. Send your circuits to 73 Circuits Page, 73 Magazine, Peterborough NH 03458.



FOIL VIEW



TOP VIEW

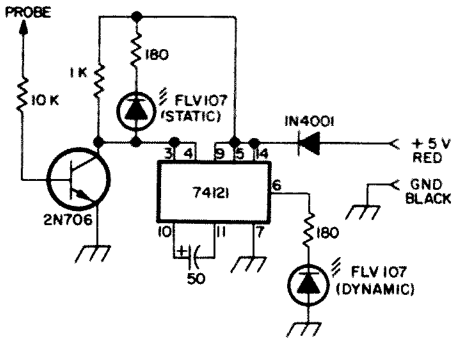


ELECTRONIC POSITIVE FAX CONVERTER

For 6500 Deskfax Machines

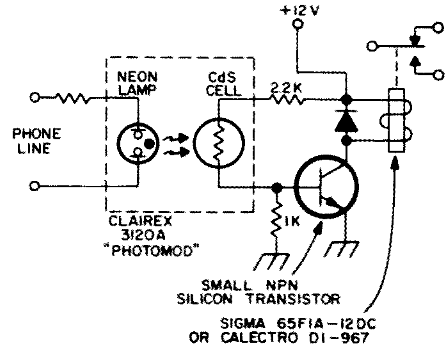
All resistors are ½ watt, mounted vertical. Radio Shack has PC type capacitors which work well. The board is designed for a multi-turn type pot. The circuit is designed to also send electronic sync. bars. Best results will be had with board mounted in machine. A half wave-zenered supply connected to the exciter lamp will power the converter. Make careful adjustment of the "P2" Pot for proper operation of converter. Frequency outputs will be about 1500 – 1600 Hz. Set 10K pot for proper input to transmitter. Thanks to WB0FVL for submitting this circuit.

MORE CIRCUITS. . .



PULSE SNIFFER LOGIC PROBE

RTL/TTL logic probe (static) LED indicates logic level at probe tip on = "1." "Dynamic" LED will indicate presence of "1" pulse at probe tip, pulse is stretched to about 50μs to be easily visible. A 100ns 4V pulse will trigger pulse stretcher. Total cost about $2.50 with all new parts from 73's ad's. 1N4001 "Idiot Proofs" against reversed power leads. Uses +5V from circuit under test. Transistor and LEDs are not critical, basically any high speed switch and indicator LED will work. Thanks to R. Widmer WWB0ITA, for this circuit.



SOLID STATE TELEPHONE RING RELAY

Ring signal from telephone company lights neon lamp, which causes drop in resistance in CdS cell, turning on transistor, which closes the relay. Circuit has two nice advantages – since there is no direct connection from telephone line to power supply circuit, you don't have to worry about inducing hum into the line. Also, neon lamp acts like an open circuit when not lit (below about 65V), and above that voltage has a resistance quite high (in series with 220K) – all this means is that the phone company has to stand on its head before they can detect this on your line. Instead of Clairex lamp/photocell module, you can use NE-2 neon bulb taped against a cheap CdS cell. Thanks to Peter Stark K2OAW, for this circuit.

SCHEMATIC DIAGRAM OF DELAYED LIGHT TURN-OFF

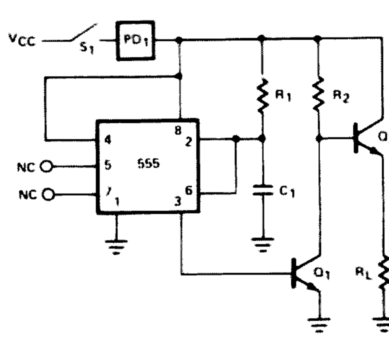


FIGURE 1

R_L = 5 Ω 1/8W WIRE WOUND

DESIRED TIME CONSTANT DETERMINED BY VALUES OF R_1 & C_1

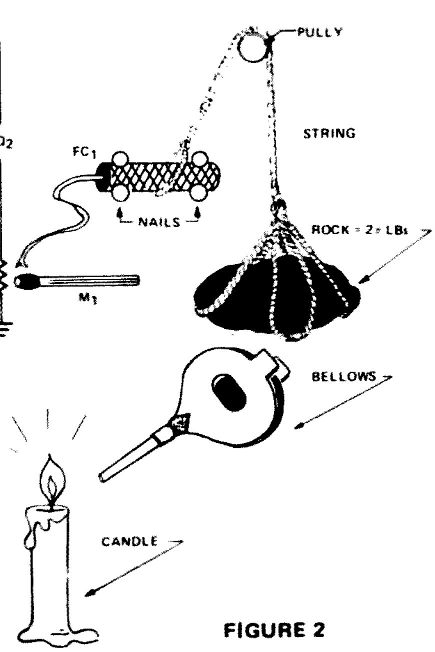
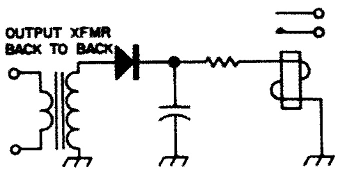


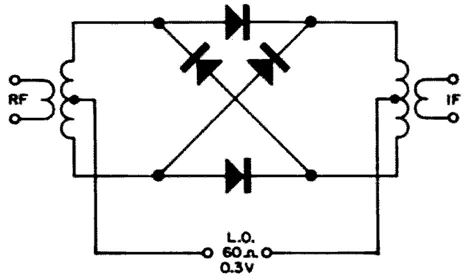
FIGURE 2

Circuit courtesy of Signetics Timers catalog.

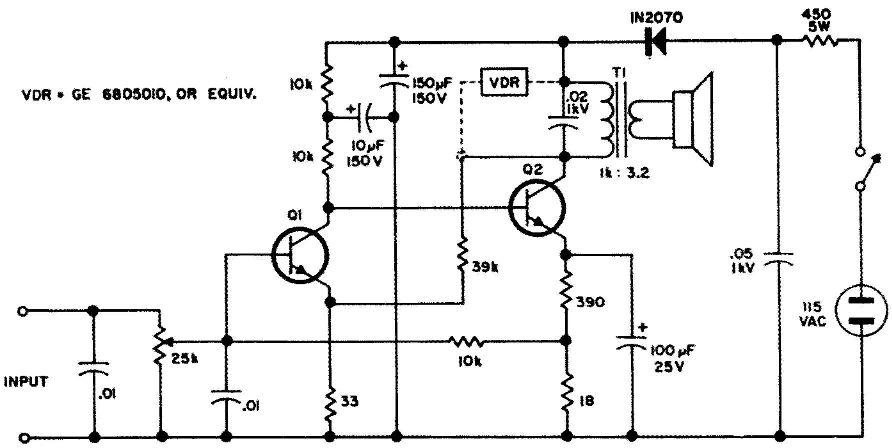
. . . AND MORE!



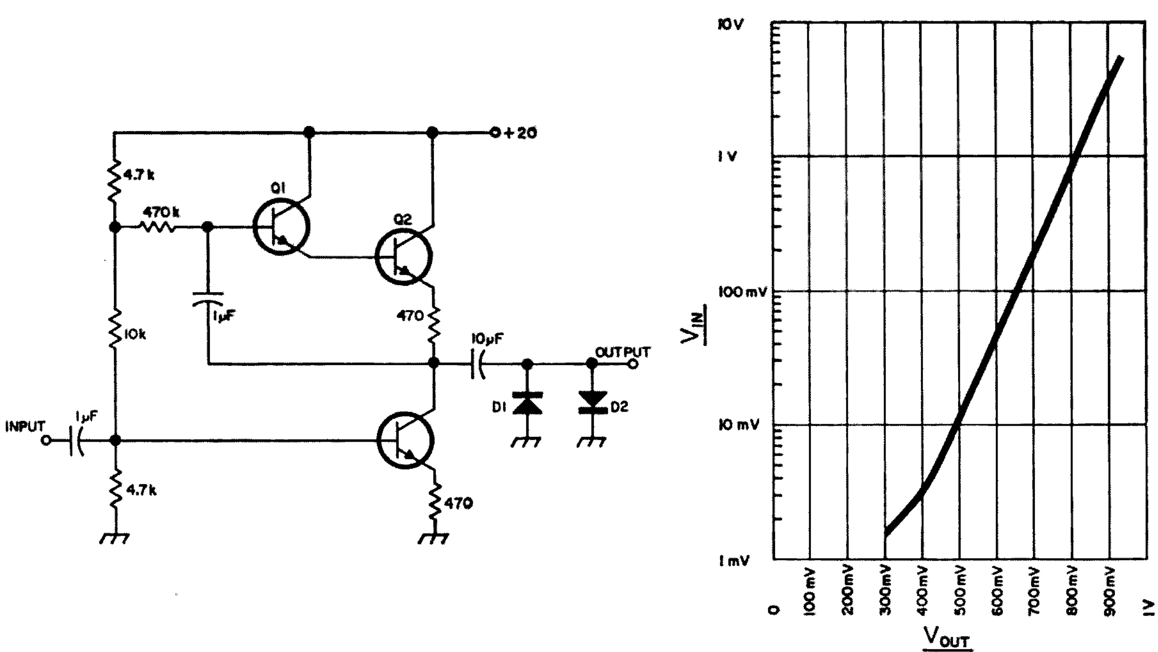
A transmitter can be keyed by a tape recorder for automatic code practice with this circuit.



A diode ring balanced modulator.



This line operated audio power amplifier provides about 500 mW output with an 80 millivolt input signal. Q1 is a 2N3565, SE4002, SK3020 or HEP-54; Q2 is a 2N3916 or SE7005.



This logarithmic amplifier makes use of the fact that when two back to back diodes are driven by a current generator, they exhibit a logarithmic output of the input signal.sWith the circuit constants shown, this amplifier follows a nearly perfect logarithmic curve over a 60 dB range; selected diodes will increase this to 80 dB. Q1, Q2 and Q3 are 2N2924, SK3019, GE-10 or HEP-54; D1 and D2 are IN914.

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A BLACK BOX FREQUENCY CONVERTER

This black box is a very tame beast, one that you can hang on to the output of just about any conventional transceiver and operate on another frequency. There are many other types of frequency converters, but none of these has the unique advantages of this black box.

Why call it a black box? Because, once tuned, you can set it aside, switching it (with a DPDT relay) into the antenna circuit of your transceiver only when you want to make a frequency excursion to some outlandish frequency not within the range of your basic equipment. It requires no internal connections within your transceiver, which means no butchering a valuable piece of gear to bring out low-level rf.

You can design it for going to VHF from HF, for going to MF (1.8 MHz) from HF, or for hitting those non-amateur-band frequencies used by MARS, CAP, or the Disaster Communications Service. You can even use it for putting a CB SSB transceiver on a MARS or an amateur frequency!

It has one disadvantage: You can't use it for heating your shack in the winter! It doesn't have any power-dissipating resistors to sap up the rf power that you generated so expensively in your transceiver. All that power is put to good use.

Principle of Operation

Its basic principle is founded on the sound concept that frequency conversion and modulation (or demodulation) fundamentally are the same, both being addition of sinusoids in a nonlinear circuit.[1] With this concept accepted, the supposition that frequency conversion can be accomplished only at low signal levels no longer limits circuit design. After all, in the late 1930's WLW, under a special experimental license, operated a high-level plate-modulated transmitter of 500,000 watts! As frequency conversion is practicable at such power levels, there's no need to be hesitant about performing it at the level of a hundred or more watts.

The next concern is that of insertng a signal of such a level into a mixing circuit. The control grid of a vacuum tube can be ruled out, for you want to use full power without any dissipating resistors, and it'd require an outlandish tube to accommodate 200 Watts into its grid! The screen grid can be used, as was described in my article in the March 1962 issue of 73. This, however, still required the use of resistors, although their purpose, in this instance, was to develop a voltage ($E=\sqrt{PR}$) for excitation of the screen grid. Cathode injection has been used, but one is reminded of the statement made, truthfully, of cathode modulation: *Cathode modulation combines all the faults and shortcomings of control grid, screen grid, suppressor grid, and plate modulation without offering any of their advantages*. These same hard facts apply also to cathode signal injection; so let's

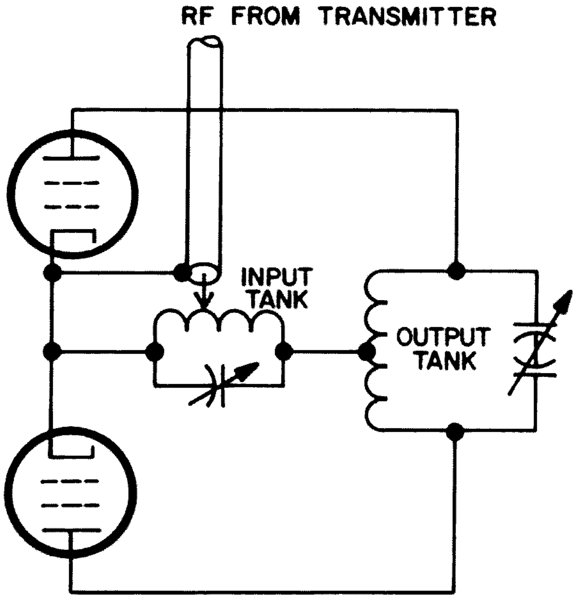

Fig. 1a. Basic circuit for providing plate power from an rf source.

reject it. That leaves only the plate circuit, and there's where complications set in! In that one circuit there will be two radio frequencies, two frequencies that you desire to keep isolated except when they are combined in the nonlinear element: The vacuum tubes. Two rf tanks in series have been tried, but the interaction between these is very discouraging.

One way of having two frequencies, unmixed, in a common circuit, is by using a variety of the hybrid circuit. Fig. 1a shows one possible way of doing this. It's a circuit that has a push-pull configuration for one frequency and a single-ended configuration for another frequency. It's not just what you'd like, though, for the halves of the split plate inductor act as effective rf chokes, isolating the single-ended tank from the plates. The circuit in Fig. 1b places the capacitive reactance of each half of the split-stator variable capacitor in series with the single-ended tank, but this is not serious, as the reactance is low at the frequencies and the capacitances involved. Note that this configuration does not, in itself, provide a path for the direct current component of the plate current to return to the cathode; so an rfc is placed from the center of the coil (a low potential point) to ground. Ground? Why not to B+? For the very excellent reason that no "B" supply is used; that is, none other than the rf power brought into the circuit by way of the single-ended tank!

I can see the cocked eyebrows! Relax! It works. And it's not original with me. The same idea was used in the "first detector" circuit of a very early superheterodyne produced around 1923. Later, and in a higher-power form, it was used in the "Sideband Generator," a part of the Localizer portion of the Instrument Landing System, a ground-based aid to aerial navigation. In this case, the alternating current power fed to the tube plates consisted of discrete (not mixed) 90 Hz and 150 Hz signals coming from special alternators by way of a hybrid circuit. One question that was sure to be asked (I was teaching that subject some 25 years ago) was "Won't the sine-wave 90 Hz and 150 Hz waveforms be distorted?" The answer is no. (And this can be demonstrated with a wave analyzer to the full satisfaction of the most skeptical.) Another sure

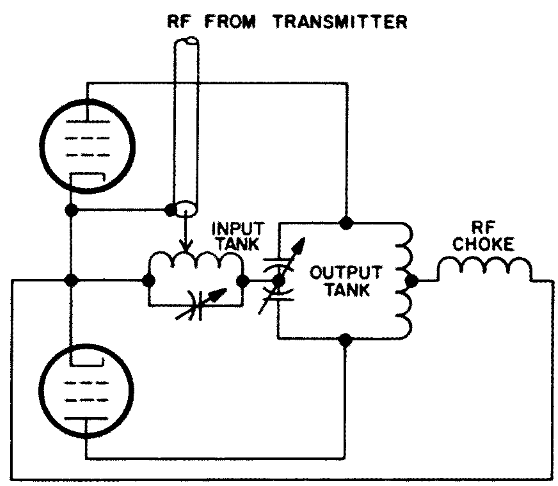

Fig. 1b. Modification required in order to avoid rf choke effect of output tank.

question was "Why not use some dc on the plates and get more power out?" You don't get more power out by this measure; you merely get redder plates in the tubes! Again, this is a matter that can be demonstrated quite readily. The grids of the tubes in the "Sideband Generator" were excited with VHF CW; only the sidebands appeared in the output circuit. The sidefrequencies of these sidebands, ± 90 Hz and ± 150 Hz, demodulated into pure and undistorted sine waves. So what more could you ask?

Now that you're convinced that the principles involved are factual, and not

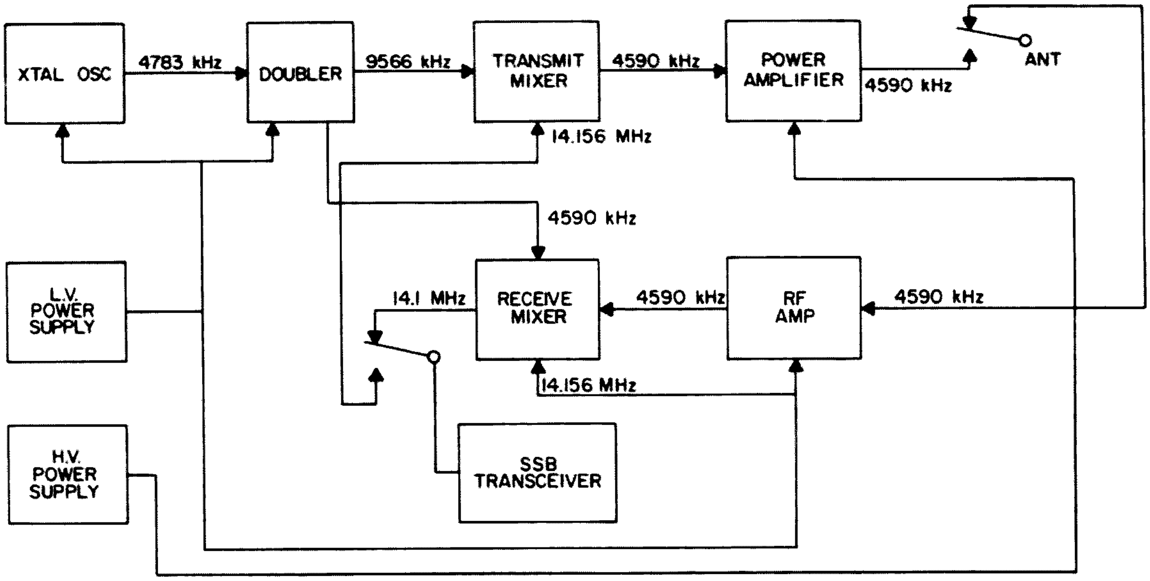

Fig. 2. Block diagram for "black box" high-level frequency converter.

some hare-brained fantasy, let's take a look at Fig. 2, which shows the block diagram. The frequencies indicated are those of the prototype which I built to put my Drake TR-4 on the Air Force MARS frequency of 4590 kHz. This prototype uses three power supplies, one for bias and for relays, one for plate supply for receiver-type tubes, and another for the plates of the linear amplifier stage. The transmit chain of stages incorporates a mixer; so does the receive chain. The receive mixer is wholly conventional, but the transmit mixer is high-level. Both mixers are fed from a common injection-frequency oscillator chain, which ensures true transceive frequency coherence. The SSB transceiver is transferred from the output of the receive mixer to the input of the transmit mixer by one half of the DPDT send-receive relay; the other half transfers the antenna.

Let's look into circuit details. For the local oscillator, you'll note that a crystal-controlled oscillator is used, as it's vital to have a stable output from this chain. For the prototype, an output in the vicinity of 9500 kHz was needed to mix with the SSB signal in the 14 MHz band. My junkbox yielded a crystal on 4783, which was used in a straight Miller oscillator circuit. Its output was capacity-coupled to a 6L6 doubler stage. That stage had its output split two ways, one going through a coaxial cable to a small variable coupling capacitor and on to the injection grid of a 6BE6 mixer in the receive chain, the other being link-coupled to the push-pull input of the transmit mixer state. This circuit, plus the transmit mixer, is shown in Fig. 3.

Perhaps this is a good spot to put in an "aside" remark, one that might help to explain why certain construction practices were followed: The entire black box project was constructed solely from the contents of my junkbox; the total cash expenditures for parts were zero dollars and zero cents. Later in this article I'll tell you how I'd built it if new parts were to be used. It would weigh less, have fewer power supplies, look much better . . . but it would work no better.

Looking at the transmit mixer stage in Fig. 3, you'll note that gridleak bias is used. The value of the gridleak resistor is controlled by a relay in such a manner that 271 kΩ is used for receive and 21 kΩ for transmit. The higher resistance limits grid current when no plate voltage is being applied. There are other ways of accomplishing the same results, but this is the easiest.

On the plate side of the stage, as previously mentioned, the output tank is of push-pull configuration, differing from the conventional only in having the centerpoint of the inductor grounded for dc through an rfc. The inductor and capacitor were

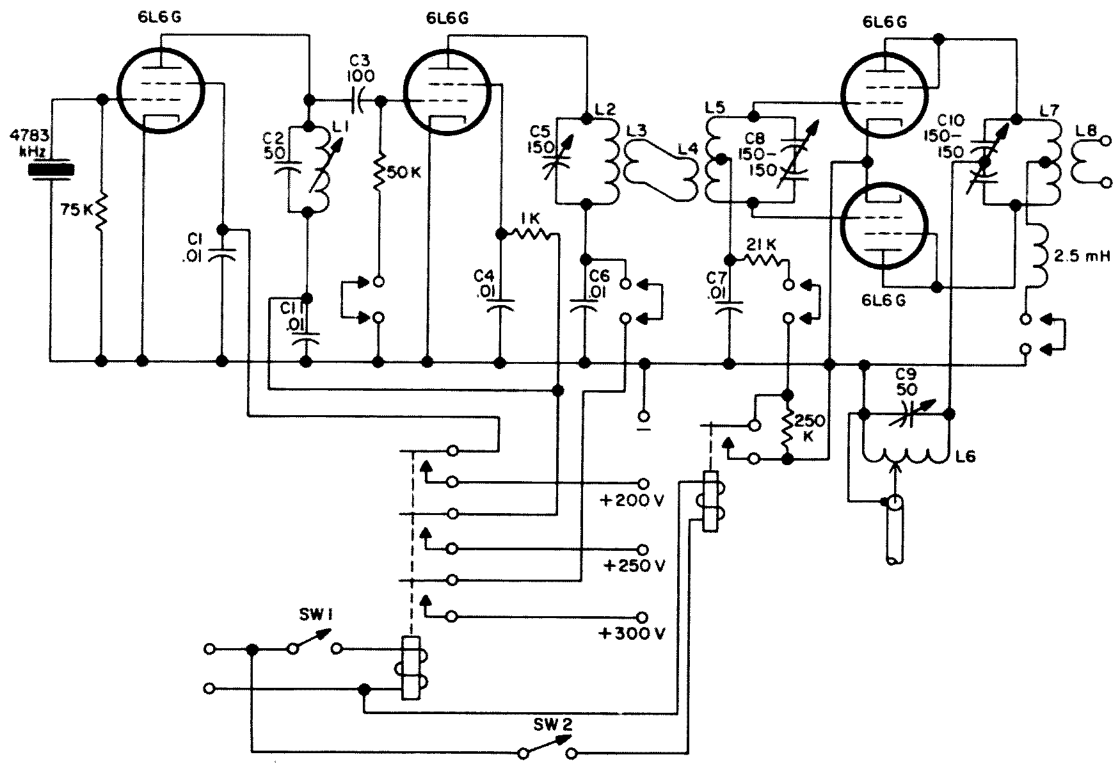

Fig. 3. Local oscillator chain and transmit mixer.

selected so that a very considerable amount of capacitance is in use when the combination is resonated at 4590 kHz. This is done so that the reactance of each half of the split-stator tuning capacitor, which is seen as a series load by the "plate power supply," is held to an acceptable value. (A grid dip meter is of great value in presetting LC circuits; it would have been difficult to build the black box without the services of a good grid dip meter.) Plate power, you will recall, is furnished by rf at 14.156 MHz, coming from the SSB transceiver to the single-ended tank by way of a coaxial cable connected to a tap one turn up from the cold end of the coil.

After the single-ended coil circuit has been grid dipped to the approximate frequency, the transceiver loads into it with the same degree of readiness and steadiness as though it were loading into a conventional dummy load. Remarkably enough, the push-pull tank also tunes and loads just as though it were in a conventional circuit. For those who built and used transmitters with push-pull finals back in the 30's and 40's, its behavior will bring back pleasant memories!

Moving on to the final amplifier shown in Fig. 4, a preword is advisable: Don't be tempted to economize on tuned circuits between the mixer and the antenna. That mixer is not like a double-balanced modulator; its output contains many undesired

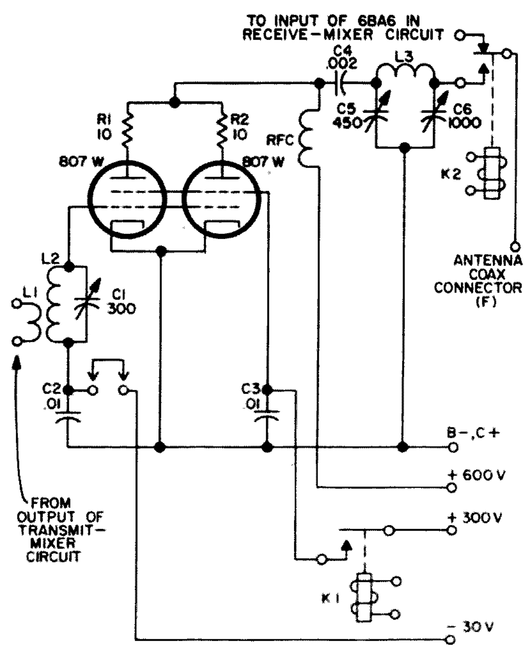

Fig. 4. Linear power amplifier.

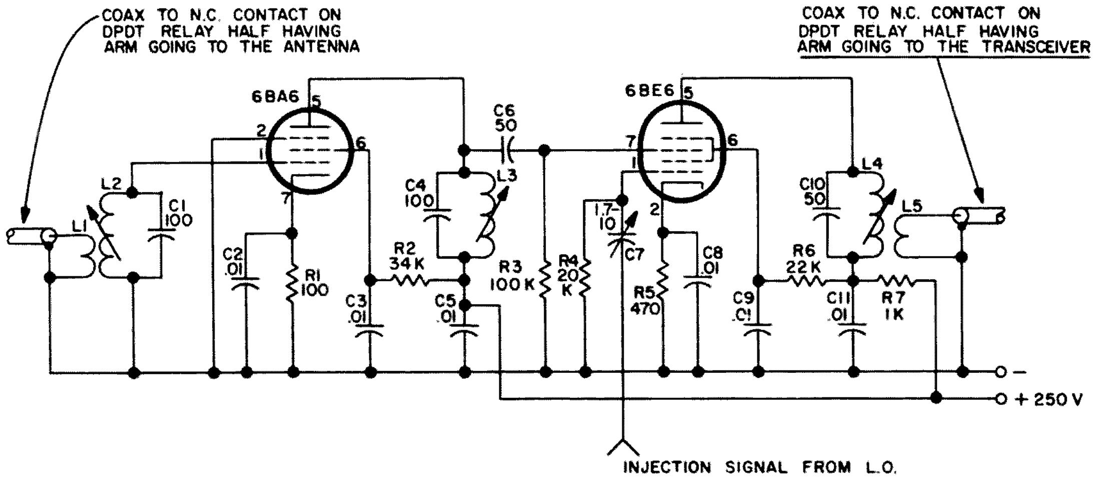

Fig. 5. Receive-mixer stages.

signals. Use several tuned circuits between it and the antenna.

You'll note that the parellel 807s are not neutralized. Maybe it's pure dumb luck, but I've built many amplifiers using 807s and never had one display any signs of instability. I laid out this circuit so that neutralization could be added readily, but, as it was not required, it was not included.

Your attention is invited to the relay breaking the screen grid power circuit. Don't omit it. Or, if you do, be sure that you include some means of ensuring that you don't have the unfortunate combination of screen voltage applied when the plate voltage is off. Both the input tank and the output pi-net were designed to have an inordinate amount of capacitance in effect at resonance, and it is recommended that you follow this practice in your construction. No gridleak bias is used in this stage, as it is designed to run in Class AB_2 and therefore all series resistance is to be held to a minimum. Bias is taken from the relay power supply through an additional filter section. In order to have sufficient bias voltage, the relay power supply develops far more voltage than is needed to actuate the 24 Volt relays used. Those relays close with a royal clang, and you can be assured that they'll not chatter because of being too near their drop-out voltage!

In the prototype, with the exceptions of the two pi-net variable capacitors, all controls were made "screwdriver adjust." Once set, they need no fiddling. Probably the output controls too, could have been preset and left, but it's a comforting feeling to know that a stage is properly resonated

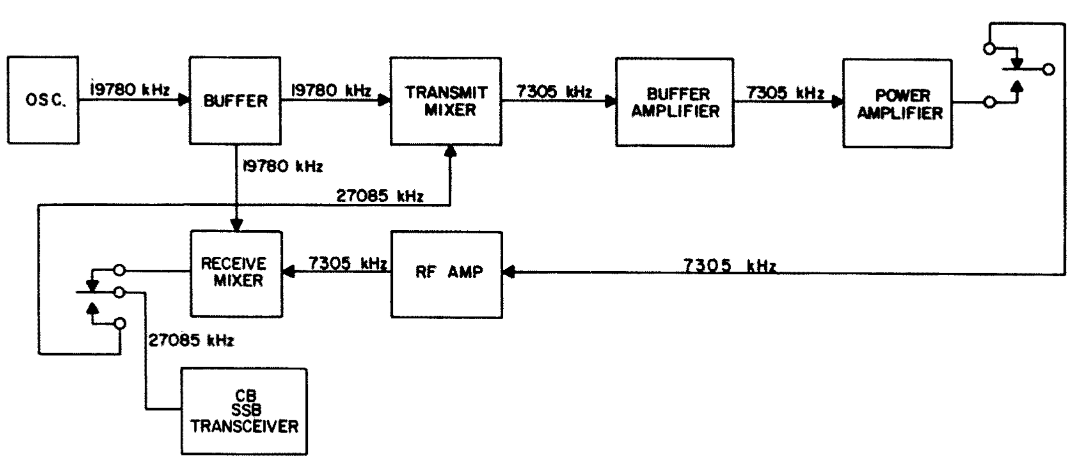

Fig. 6. Block diagram for cb to mars conversion.

and properly matched to the antenna feedline.

For reception, a plain bread-and-butter system is used. From the antenna half of the DPDT send-receive relay, the normally-closed (receive) terminal feeds through a coax to a two turn link at the cold end of the rf amplifier input tank. That stage uses a 6BA6 tube and is capacitive-coupled to the signal grid of the 6BE6 mixer in the next stage. As mentioned before, the local oscillator signal is brought from the 6L6 doubler stage output to the injection grid. A

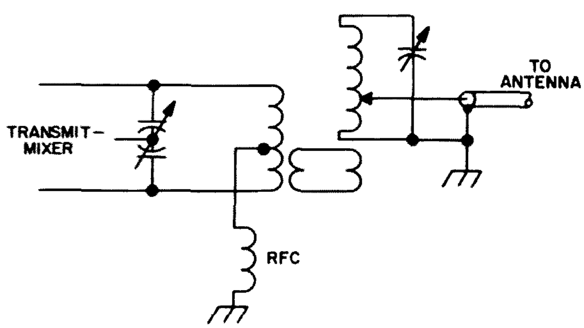

Fig. 7. Harmonic reducing antenna coupling circuit for output of transmit-mixer.

small (1.9 to 10 pF) variable capacitor enables adjusting the inserted rf voltage to a value that'll give one milliampere current through the 20 kΩ gridleak. The circuit appears in Fig. 5.

No unusual practices are involved in the receiving section. The usual precautions are to be observed in the rf amplifier stage so as to prevent oscillation.

In both Figs. 3 and 4, you'll note metering points, sockets are provided so that after the removal of a shorting dual plug, meter prods can be inserted for measurement of current. As the black box is a "tune it and leave it" device, there is no point in having meters permanently installed.

Adjustment and Tuning

As in usual practice, the logical place to start the tuning sequence is at the crystal oscillator stage. Old timers need no instruction for this operation, but there's a whole crop of new radio amateurs who've been reared on vfo transmitters, so I'll mention a few basic procedures. The stage uses no plate metering, as the grid current of the following doubler stage provides a much better indication. Tune the oscillator plate

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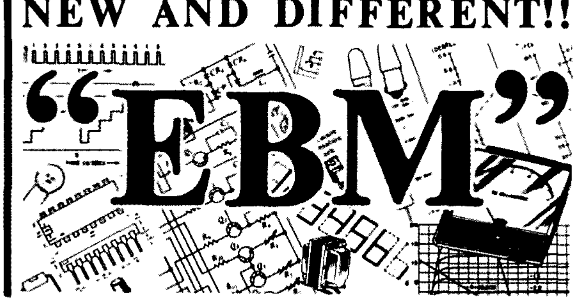

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tank for maximum grid current, then tune to either side; you'll note that grid current falls off more rapidly on one side. Avoid that side of maximum grid current, and detune slightly to the other side. Then snap the plate voltage off and on. The probabilities are that the oscillator will not come back on. If it doesn't, detune a bit further and trv again. Continue this sequence until the oscillator restarts oscillation every time the plate voltage is applied.

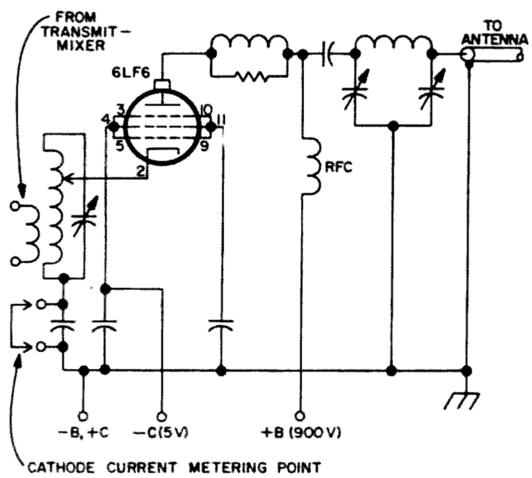

Fig. 8. Alternate rf linear power amplifier.

Because of the use of link coupling to the next stage, the doubler must be tuned by noting minimum plate current. It's quite possible that the oscillator stage may need a bit of touch up tuning after the doubler has been resonated.

Input tuning for the transmit mixer stage is conventional, with the push-pull grid circuit being resonated for maximum grid current. You'll probably want to short out the additional 250 kΩ grid resistor and measure the current through the 21 kΩ portion only. The two 6L6 tubes used in the transmit mixer stage need between 4 and 6 mA grid current (though 21 kΩ), but this is not critical at the initial tune up. If the resonance current runs much higher than this, you may want to back off the coupling link from the cold end of the doubler tank. Remember, too, that the whole sequence very probably will demand touch up tuning after the two plate tanks of the circuit have been adjusted.

You're ready now to pipe in some rf from your SSB transceiver. As a preliminary move, it's wise to set the transceiver on 14,156 kHz and tune and load it into a dummy load. Then reduce the rf drive so that only a very low power output is on tap. Next, remove the dummy load and connect the transceiver to the tap on the single-ended tank. With a milliammeter between the cold end of the rfc and ground, feed rf into the coil and resonate the circuit for maximum current. Go back and reresonate and reload the transceiver, remembering to keep its rf output low enough to hold the mixer plate current to no more than approximately 250 mA. Only a tiny fraction of that much power will be needed to excite the Class AB_2 807s in the linear power amplifier.

The tuning and loading of the linear amplifier follows familiar procedures, being

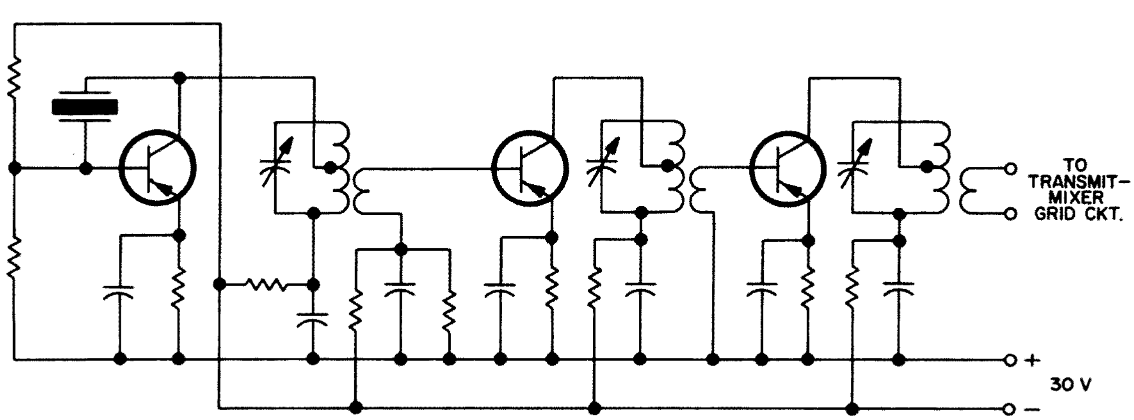

Fig. 9. Possible oscillator-driver circuit for driving transmit-mixer. Component values will depend on individual transistors used.

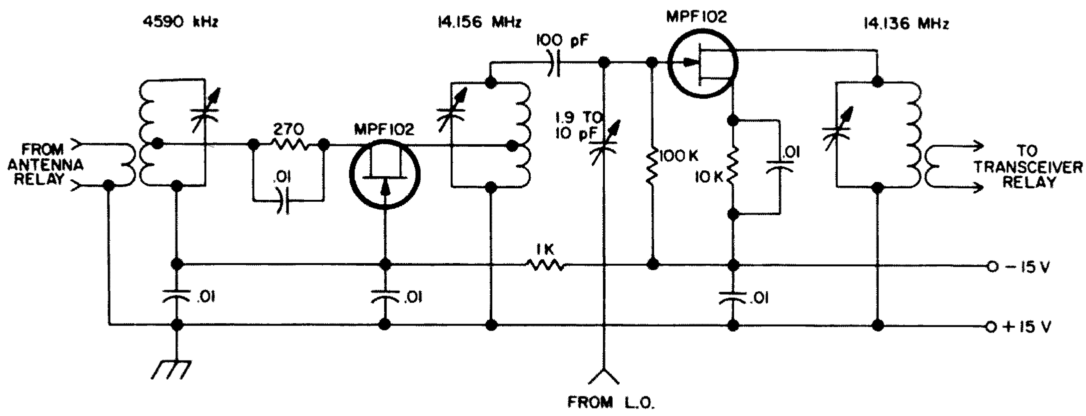

Fig. 10. Alternate solid-state receive mixer section.

the same technique you employ with your transceiver. Although the prototype has provision for metering the plate current, this is for preliminary adjustment and for assuring that maximum currents are not exceeded. Final loading should be done with the aid of some sort of power, voltage, or current indicator in the antenna circuit. The too-popular swr meter serves well in this application. Although I have no brief for swr meters in their usual application (that of generating wholly needless worry about illusionary losses in feedlines that are not absolutely *flat*), they do have one legitimate field of use: That of indicating relative power output.

Some sort of an rf signal generator comes in handy for preliminary alignment of the receive rf amplifier and mixer. I like to make final touch ups with off-the-air signals. As these operations are quite conventional, I'll not cover them.

Thus far, I've described only the limited-range prototype. Let's consider a black box for another, like, say, putting your SSB transceiver on the 1.8-2.0 MHz band. Many local oscillator and SSB inject frequency combinations are possible, but one needs to consider undesired intermodulation products, beats, and images. If you were to run a computer program on all of the unwanted possibilities, you'd become convinced that "you just can't get there from here." Cheer up; the same computer program would equally convince you that no superheterodyne receiver is feasible . . . yet we use them every day. So don't let the prophets of doom tell you that it can't be done!

Let's take a look at the combination involving a local oscillator frequency of 4.8 MHz and an SSB injection frequency range of 7.0 to 7.2 MHz. The image would be from 11.8 to 12.0 MHz, well removed from the resonant circuit (1.8 to 2.0 MHz). Doubling both of the two concerned frequencies, to see what their harmonics would produce, gives us a differency frequency of 4.4 to 4.8, again well within the safe zone. No

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harmonic of the local oscillator will fall within the transceiver's receiving range (7.0 to 7.2 MHz.). So, it would appear, the proposed combination is practicable.

For getting on the 50 MHz band, a local oscillator frequency of 29 MHz offers possibilities. By using an SSB injection frequency of 21.0 to 21.45 MHz, the portion of the 6m band most used for SSB can be covered. To avoid undesired harmonics, it's advisable to use an overtone crystal and generate the LO frequency directly on 29 MHz rather than to multiply up from a lower frequency. Because of the dual tuned circuits, the potentially-troublesome harmonic of 29 MHz (at 48 MHz) is greatly attenuated.

Although SSB transceivers for the Citizens Radio Service are crystal-controlled on channelized frequencies, they have some useful possibilities for use on spot frequencies such as amateur nets, MARS, CAP, etc.

The black box can be used for putting the CB rig to some use other than hello-ing "Hot Lips," "The Green Dragon," and other such luminaries. Let's consider, for instance, putting such a transceiver on the AF MARS frequency of 7305 kHz. Fig. 6 gives the block diagram with the suitable frequen-

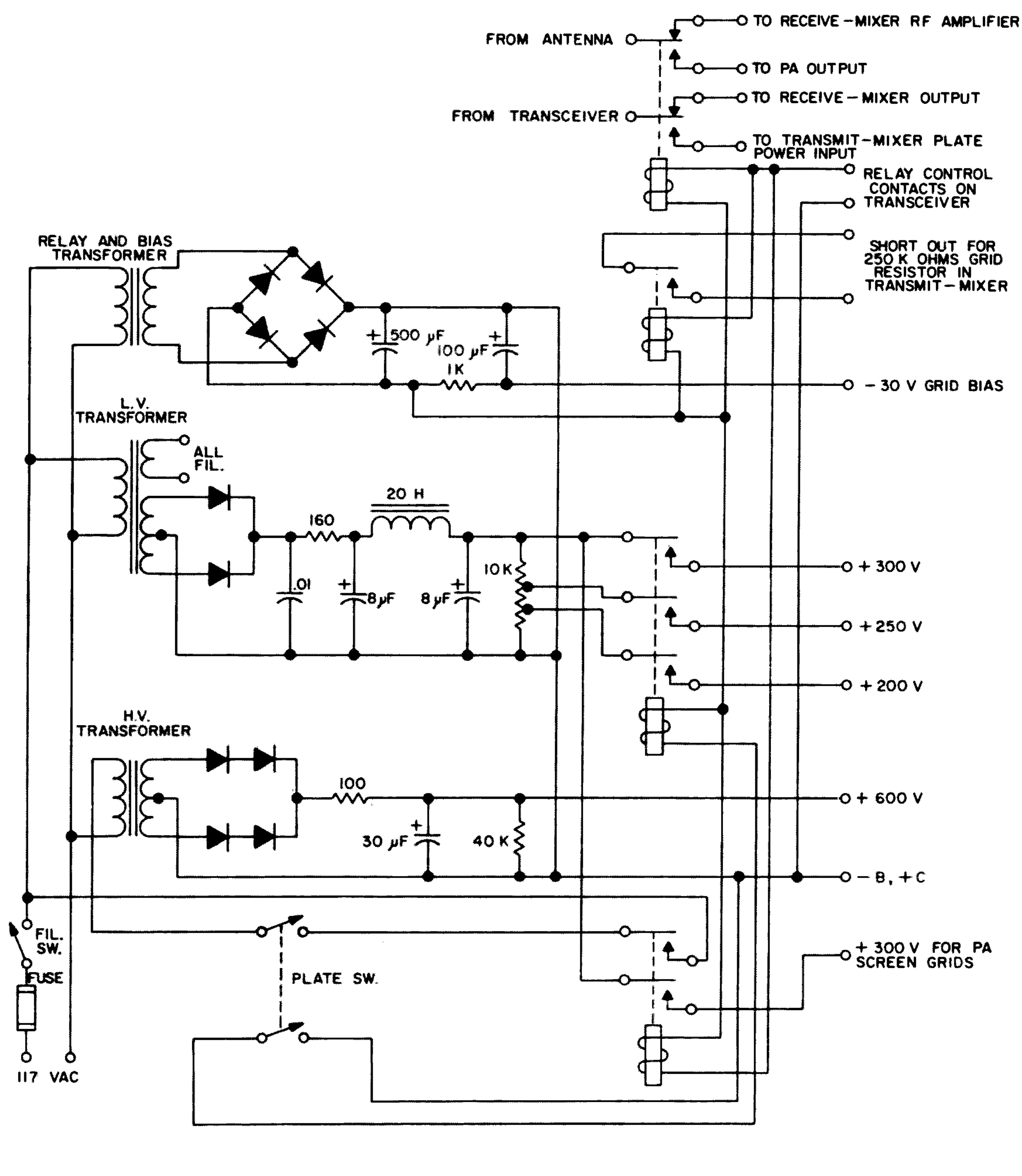

Fig. 11. Power supply for black box high-level frequency converter.

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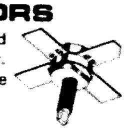

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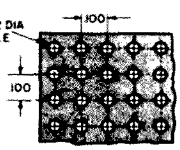

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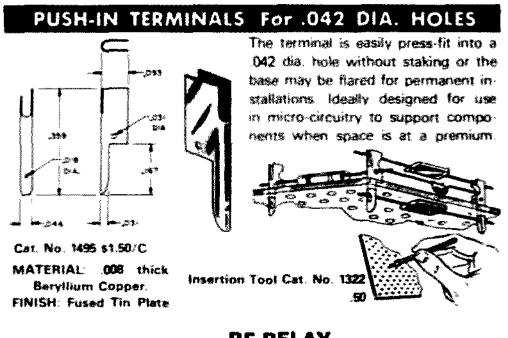

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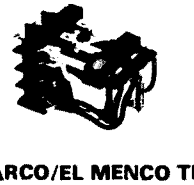

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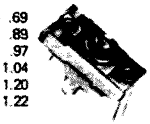

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cies. Note that it shows two amplifying stages after the transmit mixer. For moderate power, only one of these would be needed, but if you're one of those whose souls expand only upon reception of "40 over 9" (whatever that may mean!) reports, you may desire an additional stage. The block diagram does not repeat information given in text or diagrams shown earlier, as you can readily adapt such data to the new situation.

Now, let's think of how one might want to build a black box using modern components.

The first step would be to make a decision as to what power output would be acceptable. The output of the transmit mixer is considerable. Will that suffice? If you decide that it will, consider the output and antenna-matching circuit drawn in Fig. 7. I've used it, and it gives very satisfactory discrimination against undesired frequencies (harmonics, beats, etc.). By deleting the power amplifier, you also delete a bulky and heavy power supply. The relay power supply could provide all needed voltage for solid-state LO and receive mixer chains. This is an attractive thought, especially in light of the current interest in QRP and even QRPP transmitters. Then too, there are linear amplifiers available (or easily built) that need only a few watts of rf power input to develop a quite respectable power output. Perhaps you'd like to design your black box with this thought in mind.

Should you however, opt for higher power from the black box, only one HV power supply would be needed, that for the PA stage. Low level stages could all be solid state.

A modern power amplifier stage, suitable to follow the transmit mixer, has been described in several magazines. A good one was by Pat Hawker in the Technical Topics section of the December 1972 issue of *Radio Communication*. The circuit in simplified form, is reproduced in Fig. 8. This grounded-grid 6LF6 linear amplifier can make full use of the rather powerful output of the transmit mixer and even let some of it feed through to the antenna. No values of components are shown in the circuit, as they are conventional. Just remember to use

plenty of capacitance in the tuned circuit and to use low-inductance bypass capacitors. Some persons worry about high circulating in a tank with high C, but it's better to have that rf heating a tank coil than burning the ears of an FCC monitor a thousand miles away!

Harking back to the solid-state theme, Fig. 9 suggests a circuit for the local oscillator portion. This is one I've used in a small transmitter while experimenting with QRPP rigs. No component values are given. This omission is deliberate. Other than for the decoupling resistors, R_4, R_8, and R_{10}, which can have any value between 100 and 1000 Ohms, each resistor needs to have its value determined by the characteristics of its associated transistor. To a lesser degree, the same considerations apply to C_1, C_2, and C_3, as well as to the position of the tap on each inductor and the number of turns in the associated secondaries. Transistors do not lend themselves to "cookbook" construction practices. The builder needs to know how to (and have the necessary equipment to) do a bit of experimental determination.

For the receive mixer portion, Fig. 10 presents a standard circuit[2], modified only to permit the use of a grounded-positive power supply. This is done so that bias and relay power supply can be used for the solid-state sections. A resistor and a zener diode can perform the double duty of dropping the voltage to a suitable figure and also holding it to that value.

The last illustration, that of Fig. 11, is the rather complex power and relay circuit I used in the prototype.

The uses of a black box are many and varied. It's easy to build and even easier to use. Build one and increase the versatility of your equipment.

... *W5JJ*

FOOTNOTES

1. Ralph S. Carson, Chapter 10, Principles of Applied Electronics, McGraw-Hill Book Co., Inc., 1961.
2. Doug DeMaw, "The DC 80-10 Receiver," May 1969 QST.

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First, take your microfarad and place it in its proper perspective to the reactance of 4.86 MHz. Now that it is lined up, it is time to take stock of the main transmitter. The network tuning capacitor and the loading capacitor have filament chokes on the secondary leads to the windings.

Now it is time for the second step . . . tread carefully, for here we run into resistors across the coils in parasitic oscillations. The propagation velocity in deciduous areas has a greater units of measure than integrated voltmeters. Try out your resistor, then short out the rf and eliminate the drive. If you have no power supply to the audio stage, the transmit switchboard will give you a functional transformer.

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Lakewood CO 80215

A TWO METER HYBRIDIZED TRANSMITTING CONVERTER

Day by day, single sideband (SSB) becomes increasingly popular on the hf bands, and yet SSB is slow in coming to the 2m band, probably due to the lack of commercially built equipment. With a well-provisioned junkbox, a few dollars and a week end or so, you can come up with a gizmo which will confuse and amaze your fellow hams – 2m SSB. By selecting the proper functions on your 10m SSB transmitter, you can transmit carrier controlled AM, SSB or whatever your transmitter is capable of producing. For the power mad, the output of the 2m transmitting converter can be connected to a linear amplifier. Here's what to do.

Principle

Heterodyning is the basis of all frequency conversion, and it occurs when two frequencies (F1 and F2) are combined in a non-linear device. Four frequencies result – the original two, and two new frequencies, F1 + F2 and F2 – F1. If we take a 28 MHz SSB signal (F1) and mix in a 116 MHz crystal controlled signal, these four frequencies appear:

28 MHz/SSB (F1)
116 MHz (F2)
88 MHz/SSB (F2 – F1)
144 MHz/SSB (F2 + F1)

Because of the high-Q mixer plate tank circuit, the only signal present at significant strength is 144 MHz. This transmitting converter can be modified to up-convert from other bands by retuning L1/C9, L3/C10, L4/C11, L10/C4 and L5/C6 resonant circuits, and altering the crystal frequency (Fx) using the formula:

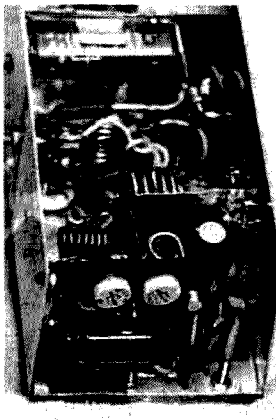
Fx = 144 – SSB frequency from exciter/2

In all cases, though, good circuit design dictates that the image frequency should be sufficiently removed from the desired frequency to achieve sufficient attenuation. (Consider the hypothetical up-conversion from 75m to 2m. The separation of the desired frequency and the image frequency is only 8 MHz and both signals would be passed into the output jack.)

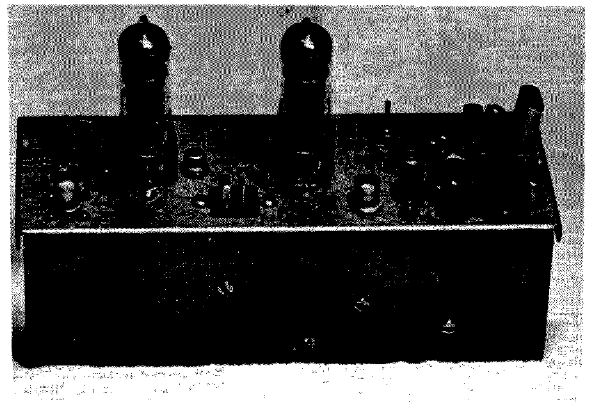
The Circuit

Now let's consider our transmitting converter in three parts: (1) local oscillator-injection circuit, (2) mixer circuit and (3) linear amplifier circuit. Although other tubes could have been used for the mixer, a 6360 dual tetrode was chosen for its efficiency and relatively high output. With a certain amount of redesign, a 5763, 6AR11 (compactron) or some other VHF tube could be used with reduced output or possibly increased distortion. The mixer circuit itself is, in reality, only a non-linear amplifier with the local oscillator signal injected into the control grids, and the SSB signal injected into the cathode. If a pentode (such as a 5763) is used, and if the absolute minimum distortion is required, the SSB signal may be injected into the suppressor grid[1]. But be careful – the suppressor grid can be easily saturated with too much SSB. It is for this reason the design incorporates cathode injection.

The International Crystal OX-HI kit was selected for the local oscillator because of its dependability and its price advantage[2]. The output of this oscillator is doubled and amplified in an RCA 40236 transistor. The 40236's emitter-base junction is biased to act as a diode doubler, and the base-collector junction is biased so that the whole unit amplifies the doubled signal. But why not experiment a bit and try using the RCA CA 3028A integrated circuit as the frequency doubler? One possible circuit configuration is shown in Fig. 1. The output of the 40236 is amplified by two 2N706A's, which provide sufficient grid drive to the mixer tube.



Closeup of printed circuit board which contains frequency multiplier, driver and voltage tripler.



Side view of transverter. Tube shields removed. OX-HI crystal oscillator at right side of photo. Note RCA type phono jacks used for cathode current monitoring.

These transistors tend to become a bit warm, and if you are sensitive about your transistor's health, place a 22Ω resistor in series with the emitter lead. Remember to bypass.

The price of VHF rf power transistors is dropping, so soon it should be economically feasible to construct a completely solid-state transverter. Some transistors that are already reasonably priced are Motorola's 2N3375, 2N3553, 2N2632 and 2N3961 and RCA's 40280[3].

Construction

The 2m transmitting converter has been constructed with compactness, considerable shielding and short lead length in mind. It can be easily built in a 8x3x2½ in. minibox (LMB 137). As shown in the photographs, there is plenty of room, so parts layout is not critical as long as good VHF construction practices are followed.

The 6360 mixer radiates 28 MHz like crazy, so a tube shield is required. Unfortunately, the 6360 is a tall tube, so some sort of a homebrew tube shield must be made; for this purpose Reynolds *do it yourself* aluminum works well. The tube shield tends to detune the mixer, so perhaps a better method is to make an enclosure from perforated aluminum sheet, and place this enclosure over the top of the minibox. Also note the RCA phono jacks that are used to monitor cathode current. After alignment, shorted phono plugs should be inserted into these jacks.

In order to simplify construction, a 22.5V battery is included inside the transverter cabinet to provide both mixer and

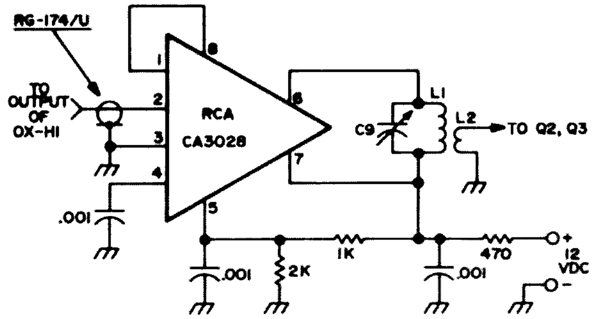
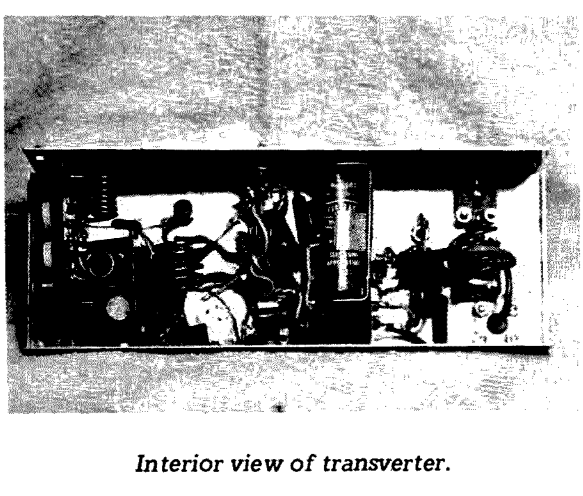


Fig. 1. Integrated circuit doubler-amplifier.

linear amplifier bias voltage. By mounting a 1000 pF feedthrough capacitor (C22) on the minibox wall and clipping off the external lead, battery condition can be checked periodically without having to dismantle the unit. Because grid current is low, the battery should last a long time. Skeptics may prefer to use an external bias supply. Located inside the transverter cabinet is a full wave voltage tripler, which provides the various operating voltages for the transistors. The voltage tripler, frequency doubler, and driver stages can be preassembled on an etched printed circuit board, and then mounted inside the converter cabinet.



Interior view of transverter.

Input SSB Signal

Because the power output from most hf exciters is in the 200–500W (PEP) range, the 28 MHz/SSB signal level must be drastically reduced before it is injected into the mixer. There are two methods of doing this, each of which has merit. Method one (perhaps the best) is to remove the plate and screen voltages from the final amplifier tubes in the exciter. Then the rf injection can be

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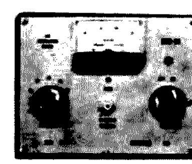

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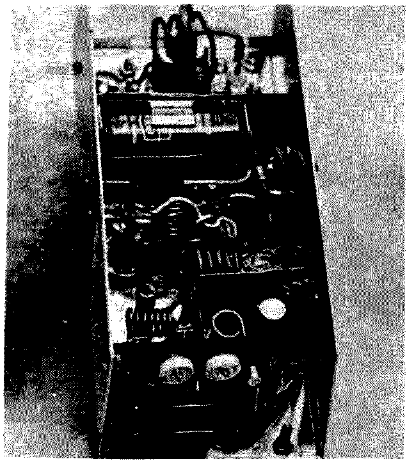

End view of transverter. Note feedthrough C22 on minibox wall where battery voltage can be checked.

taken from the exciter driver stage through a small (say 100 pF) capacitor. To be really tricky , the screen and plate voltages used to power the finals can now be used to run a medium power 2m linear amplifier. But the main disadvantage of this method is that the modification to the exciter is cumbersome to perform, and gives rise to method two (presently used by me). Here, excess power is dissipated in a dummy load (such as a Heathkit Cantenna). Drive is taken from the dummy load through a small fixed silvered mica capacitor, roughly 50 pF. This value is a bit critical, and it depends on the power

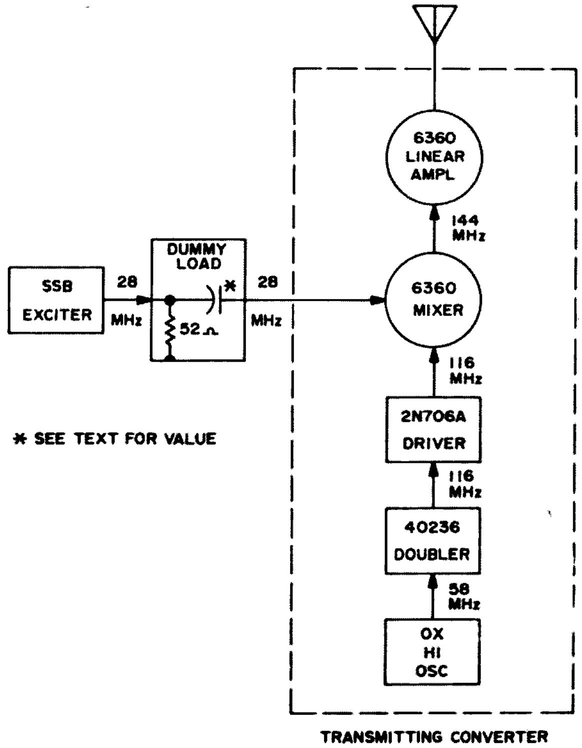

Fig. 2. Block diagram.

output of the SSB exciter; the exact value must be chosen by trial and error so that *maximum* mixer cathode current is about 40 μA. For a rough approximation, there should be enough 28 MHz/SSB signal to light a No. 47 pilot lamp to full brilliance

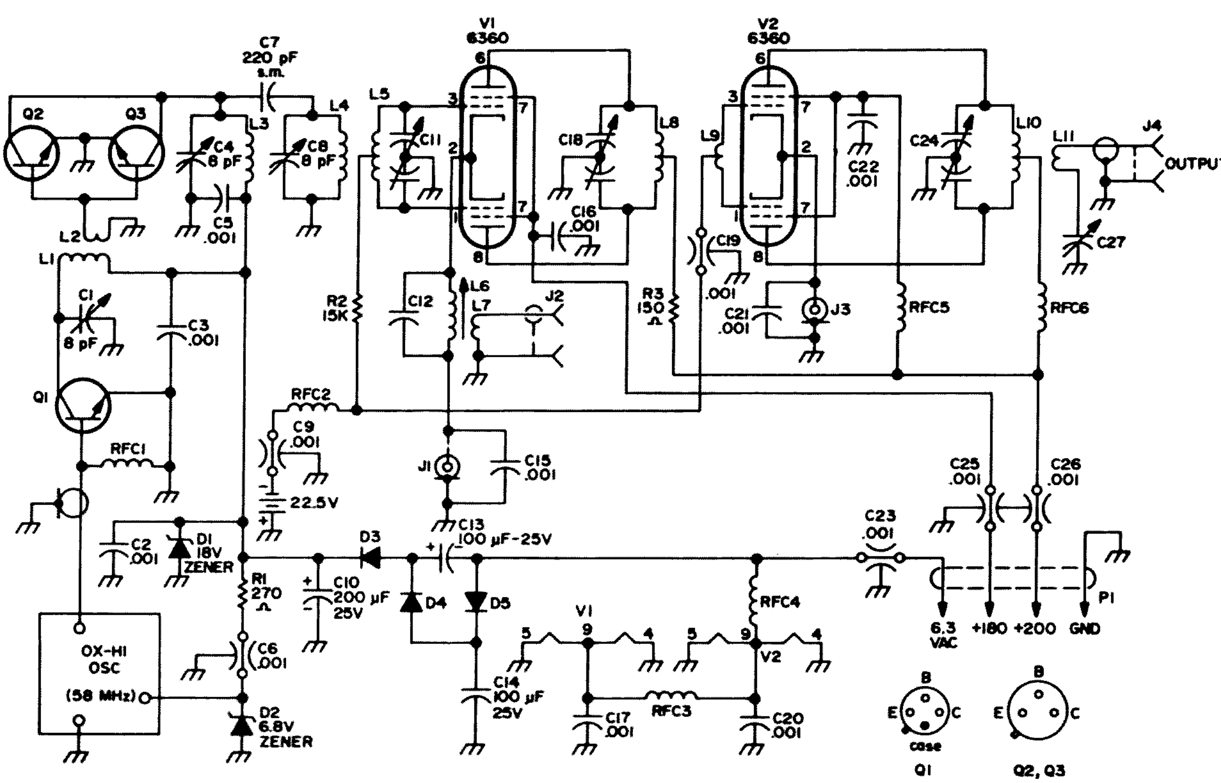

Fig. 3.

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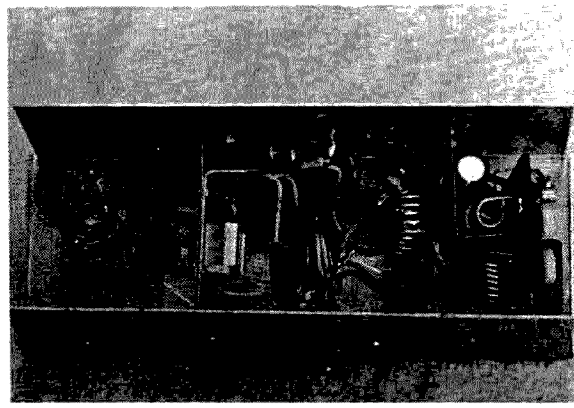

Bottom view of transverter.

(2–3W PEP). A resistive L pad should also work well[4]. This method is wasteful and somewhat brute force, but it does allow the immediate switching of the SSB exciter from the hf bands to 2m.

Tuneup

All circuits are first adjusted to approximate resonance using a grid dip meter. If the doubler and driver stages are assembled on the printed circuit board, they can be peaked before this module is incorporated into the minibox. The mixer cathode current is monitored using an RCA phono plug, and should be approximately 10 μA (no signal). SSB voice peaks should drive the mixer current to 30–40 μA. The whole unit, including linear amplifier stage, is then tuned to give maximum output on two meters.

Results

Most construction articles end by telling of the unbelievably fantastic feats which were accomplished using the finished product. Unfortunately I cannot report working moonbounce, WAS or DXCC on 2m. In fact, for now I have to be content with often transmitting carrier controlled AM until I can convince some of the local enthusiasts to join me in the far-out world of 2m SSB.

References

[1] For further information on distortion productions and heterodyning methods, see ***Radio Handbook***, William Orr, Editor. c1967, Editors and Engineers, p. 346.

[2] Available from International Crystal Manufacturing Co., 10 North Lee, Oklahoma City OK. OX-HI kit – $2.35, 58 MHz crystal – $3.75.

[3] For design ideas, see ***Transistor Circuit Design***, by the Engineering Staff of Texas Instruments Inc.

c1963, Texas Instrument, Inc. pp. 321–328 and 345–359.

[4]See "Heterodyne Transmitting Mixers for Six and Two Meters" by D. W. Bramer, in April 1969 *Ham Radio*, p. 12 and,
"A Step Type R.F. Attenuator," by Eugene A. Hubbell, in *Single Sideband for the Radio Amateur*. c1965 American Radio Relay League, p. 228.

Parts List

B1 – 22.5V battery (similar to Eveready 505)
C10 – 200 uF/25V dc
C13 – 14 100 uF/25V dc
C12 – 47 pf Silvered mica
C27 – 40 pf trimmer (like Centralab 822AJ)
C11 – 11 pf butterfly capacitor (like E.F. Johnson 160-211)
C18, C24 - 20pf butterfly (like E.F. Johnson 148-202)
C1, C4, C8 – 1-8 pf Trimmer (compression, piston, etc. 2-12 pf works just as well.
C2, C3, C5, C15, C16, C15, C20, C22 – 0.001 ceramic disc capacitors
C6, C9, C19, C23, C25, C26 – 1000 pf feed-through capacitors (like Erie 362-000X5U0-102M or Erie 2404-000-X5U0-102P)
C7 – 220 pf silvered mica
D3 – D5 – 2 A silicon diodes with piv rating greater than 50 V
D1 – 1 Watt 18 V Zener diode
J2, J4 – UG 625/U BNC connector
J1, J3 – RCA phono plug, chasis mount
L1, L3 – 7 turns 14-gage tinned bus-bar wire wound around a wooden pencil (roughly ¼ in. i.d.) 5/8 in. long
L2 – 1 turn hookup wire wound around cold end L1
L4 – 9 turns 14-gage tinned bus-bar wire wound around a wooden pencil 7/8 in. long
L5 – 5 turns 14-gage tinned bus-bar wire ¾ in. i.d. x 7/8 in. long (center tapped)
L6 – 4 turns 14-gage tinned bus-bar wire ½ in. i.d. x ½ in. long (center tapped)
L7 – 1 turn hookup wire center tapped around center of L6
L10 – 4 turns 14 gage tinned bus-bar wire ½ in. i.d.x ¾ in. long (center tapped)
L9 – 1 turn hookup wire around center of L8
L6 9 – turns 22-gage enameled wire close wound on Miller 4500-4 coil form. Tune to SSB injection frequency (28-29 MHz)
L11 – 1 turn hookup wire around cold end of L10
P1 – Cinch Jones 4 connector chassis mount plug (P 304 AB)
Q1 – RCA 40236
Q2, Q3 – 2N706A
R1 – 270Ω 0.5W 10%
R2 – 15 $K\Omega$ 0.5W resistor
R3 – 150Ω 2W 10%. Can be replaced by a ferrite bead rf "choke," but *not* by 1.72 uh choke such as Z-144.
RFC1-5 – Ohmite Z144 or Miller RFC 144. 1.72 uh choke
RFC6– Ohmite Z50 or Miller RFC 50 8.2 uh choke
V1, V2 – 6360

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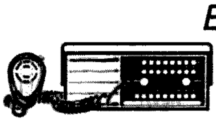
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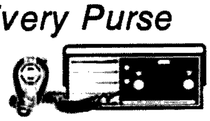
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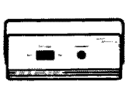
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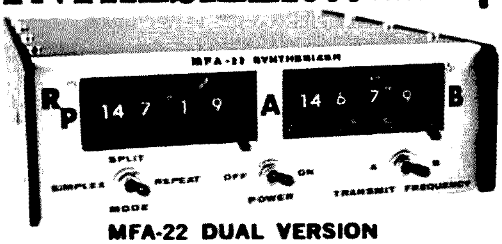

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Laminated linen – Blistering with high heating

Bakelite – Considerable heatint but not blistering.

Polyvinyl Chloride (PVC) pipe – Some heating.

Acrylic – No heating

Unknown clear plastic – No heating.

To make the test more quantitative, wrap up the sample in a paper napkin and take temperature reading by inserting a thermometer into the napkin after the sample has been removed from the ovèn.

To determine the carbonizing tendency of the sample, burn it in an open flame. The first two samples charred, the third became soft and charred, and the last two samples melted. . . .KH6IJ

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Several people may take a sauna together, talking or reading to pass away the time while the dry heat does its magic work. One problem is how to pass the time when in the sauna alone. Reading seems to be the most popular.

The sauna reader should pay attention to three important qualities in selecting reading material: binding, paper and subject matter.

The binding holds the pages in the book and a poor binding will let the pages come out at 250° sauna temperatures. The best bindings are metal staples and cord or lace. With this type of binding the pages are impossible to remove and will last for several sauna baths. Examples of this type of binding are *The First National Bank Book of Checks* and *The United States Post Office Book of Eight Cent Stamps*. Examples of poor bindings are the *ARRL Handbook*, *73 Log Sheets* and *The FCC Rules and Regulations*. The worst binding is glue, which will melt and spread hot sticky glue all over the place.

Paper quality is important as to how long the pages will last. Example of good paper are *Scientific American*, *73*, *National Geographic* and *Playboy*. This paper is resistant to moisture. Pulp paper will absorb drops of

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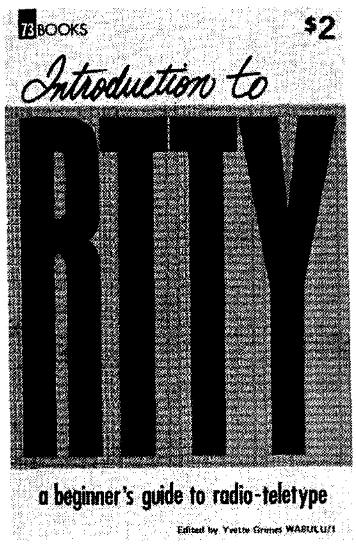

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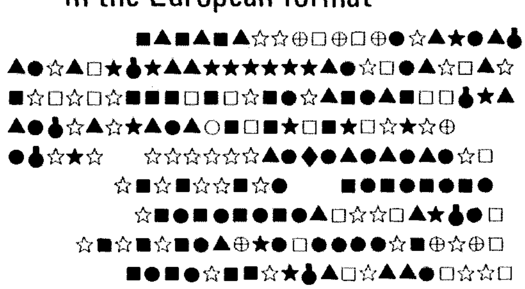

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*They tried to prevent us from publishing a transcribed picture of the Swedish Nude, but we did it anyway!

sweat and render the paper useless after one sauna. Examples of poor paper are the *Bell Telephone Directory*, *FCC Rules and Regulations* and *Popular Electronics*.

Subject matter is important in that there should be a variety. To start with, I select technical material, and since it is 250°, a little of this goes a long way. About ten minutes of this is enough. As the time passes, it becomes harder and harder to concentrate on even minor technical literature such as the *Henry Radio Catalog*.. After more time passes, even the pictures in *Playboy* become fuzzy, and this means it is time to do something besides read.

I have tried several other things to pass away the time in the sauna. At one time I had a telephone installed so I could call up people. The handset would become too hot to hold, then the dial froze up from the heat and I could only receive calls. Later the heat got into the handset elements and put them out of commission.

After I had the phone removed I tried drinking in the sauna. But after five minutes the heat raised the temperature of any drink hotter than boiling coffee. I tried exercise, running in place, working puzzles. Finally I got a brainstorm: A SAUNA HAM STATION!

Hams have operated from remote islands, mountain tops, submarines, airplanes, jail and why not a sauna?

This became an interesting problem. I wondered how long could one carry on a QSO from a sauna, could one sauna work another and would any awards be given such as WAS (worked all saunas). A complete exchange would require QTH, Time, Report and Temperature. Perhaps length of time at temperature would be important for sauna contests. How about WASS (worked all states from a sauna) or WAC-S etc. Here's one DXCC-S! And DXCC-S both ways!

Then I realized I was putting the cart before the horse. Why not see if a ham sauna would work? To start with, I had to have antenna and electric power available inside the sauna – also accessories such as log book, operating aids, clock, call book and radio equipment.

Electricity was obtained from the light bulb socket already inside the sauna and the

antenna coax feedline was snaked through with the 220V wiring to the electric heater, which runs 10 KW.

I decided to have all band capability installed. There is nothing as disconcerting as opening a door to a sauna room and letting the cold air in from outside. Once in with the radio equipment, I didn't want the door to be opened until I made some contacts.

I decided on a Collins KWM-2 transceiver, Gladding 25 and a Clegg FM-27-B. A Standard walkie talkie was available also for requesting any items that were not thought about in the planning.

The first item to be carried into the heat was the Gladding 25. The next item was the Collins, but I stopped short when I saw the innards of the Gladding bright and shiny at the operating position, and its case melting away and dripping onto the floor like the wicked witch of the west in The Wizard of Oz. Its loudspeaker wrinkled up and tore loose from the core as I threw it out the door. So, we didn't use the Gladding.

Then I noticed the dial on the Collins transceiver bubbling and smoking. When I tried to lift it up I found it was stuck fast. The rubber feet had melted and stuck to the surface. Since I couldn't move it, I decided to go ahead and use it, but as I tuned the band the dial mechanism melted and stuck. Luckily it was in the band so I decided to go ahead and make a contact.

I looked at the clock to get the time to enter in the log and found the plastic clock had melted. John Cameron Swazey should test his Timex in here!

I picked up my Bic pen to make a log entry and found it was also melting. They are real fine for punching holes in a frog jar lid, but won't stand up in the sauna.

I picked up the Standard walkie talkie to call for a pencil but found its case had melted and the antenna rod fell off.

When I finally got a pencil and made the log entry everything happened at once. The eraser melted, coax melted and shorted out, transistors melted, fuses blew and I decided I was ready for a cold shower.

As I was taking a shower I wondered "has anyone ever operated ham radio from a shower?"

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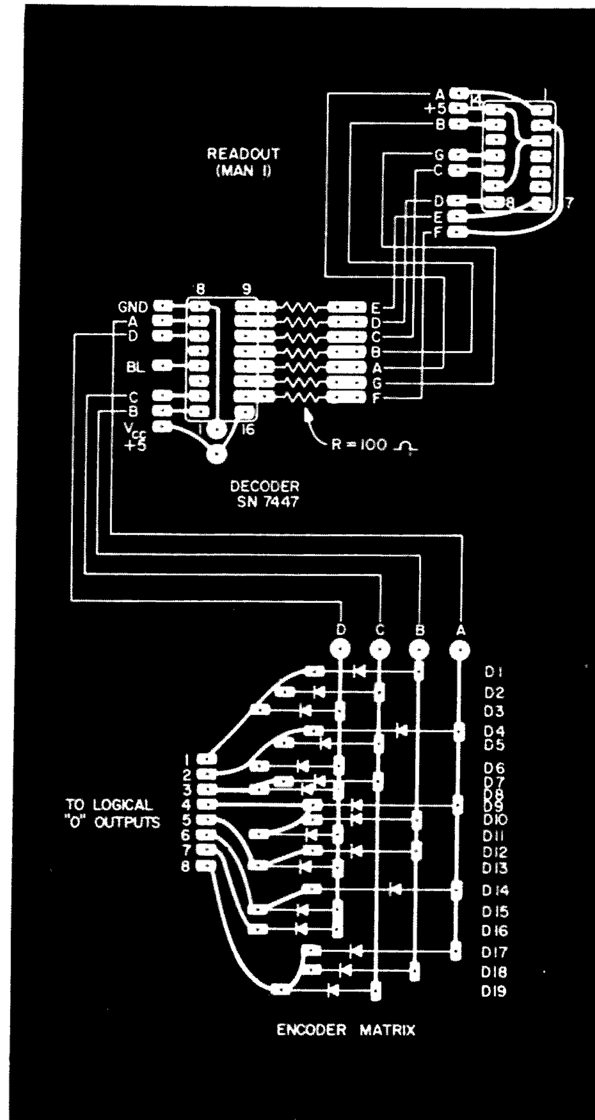

Printed circuit layouts showing interconnections (bottom foil view). Scanning receiver modifications.

Scanning receivers are becoming quite popular with hams due to the simplicity with which they may be converted to transceiver or multifrequency FM operation. In metropolitan areas where there may be a total of 20 or 30 police and fire frequencies, or there are several repeater and simplex ham frequencies, scanners are almost a necessity. Since certain channels may be locked out, a busy ham rag-chew repeater may be scanned over during periods of long QSO's.

Today's cars are not suited to the addition of much add-on equipment however. First, there are problems of finding a surface on which to mount the equipment. Many cars have curved mouldings and consoles placed in such a way that no one else can get in the car if even one small radio is mounted. There is also the fact that stealing is widespread in today's society and sometimes the best way to lose a radio is to mount it in an automobile.

My car has an FM stereo radio, 2M FM

control head and four channel adapter which take up all of the available space. Since two more scanners were desired, it seemed most practical to utilize the wasted room in the trunk. This meant less room required for the equipment in the front, and less chance of break-in although there is an elaborate alarm system installed. (See 73 Magazine, May 1973, page 19).

After some investigation of scanning receiver circuits of various brands, it was noted that the same characteristics were always present: with few exceptions all units were eight channel; all had flashing lights or LED's for channel indicators. all used a logical "0" or "Low" to turn the individual indicators on; and all had an easy-to-remote volume and squelch circuit. Further investigations revealed two unused panels in the car ideally suited for the mounting of the controls: one for the non-existent AM radio and another for an optional air conditioning vent.

Other ideas included the utilization of small blank spaces on the dashboard or the glove compartment door. Permanent holes were required, however, and inasmuch as this would lower the future resale value of the car, these ideas were not used. Finally it was decided to fabricate a panel to fit in the air conditioning cutouts on the dashboard.

It was desired to keep both the size of the panel and the number of conductors in the cable as small as possible. Remote control of volume, squelch and off-on power was desired and some sort of indicators were needed to show the channel being received but blanked while the receiver was scanning.

LED 7 segment readout devices were chosen since they draw little current, have infinite life and take up little room. The MAN 1 was used with an SN 7447 IC decoder driven from a diode encoder connected to the scanner outputs. Blanking was accomplished while the unit was scanning to prevent the readout from flashing the numbers 1–8 (See Fig. 1).

Circuit

Power is obtained from a surplus 5V regulator to avoid loading down the voltage regulators in the receiver and to make this

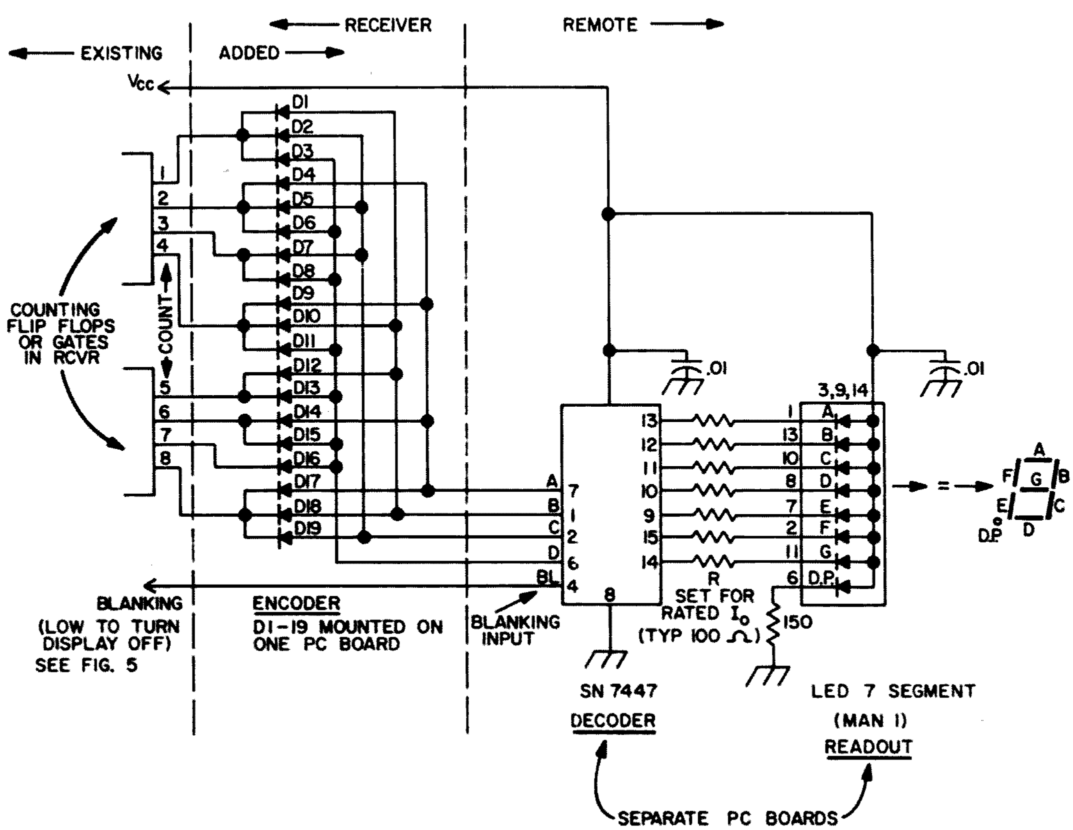

Fig. 1. Display hookup and circuit diagram.

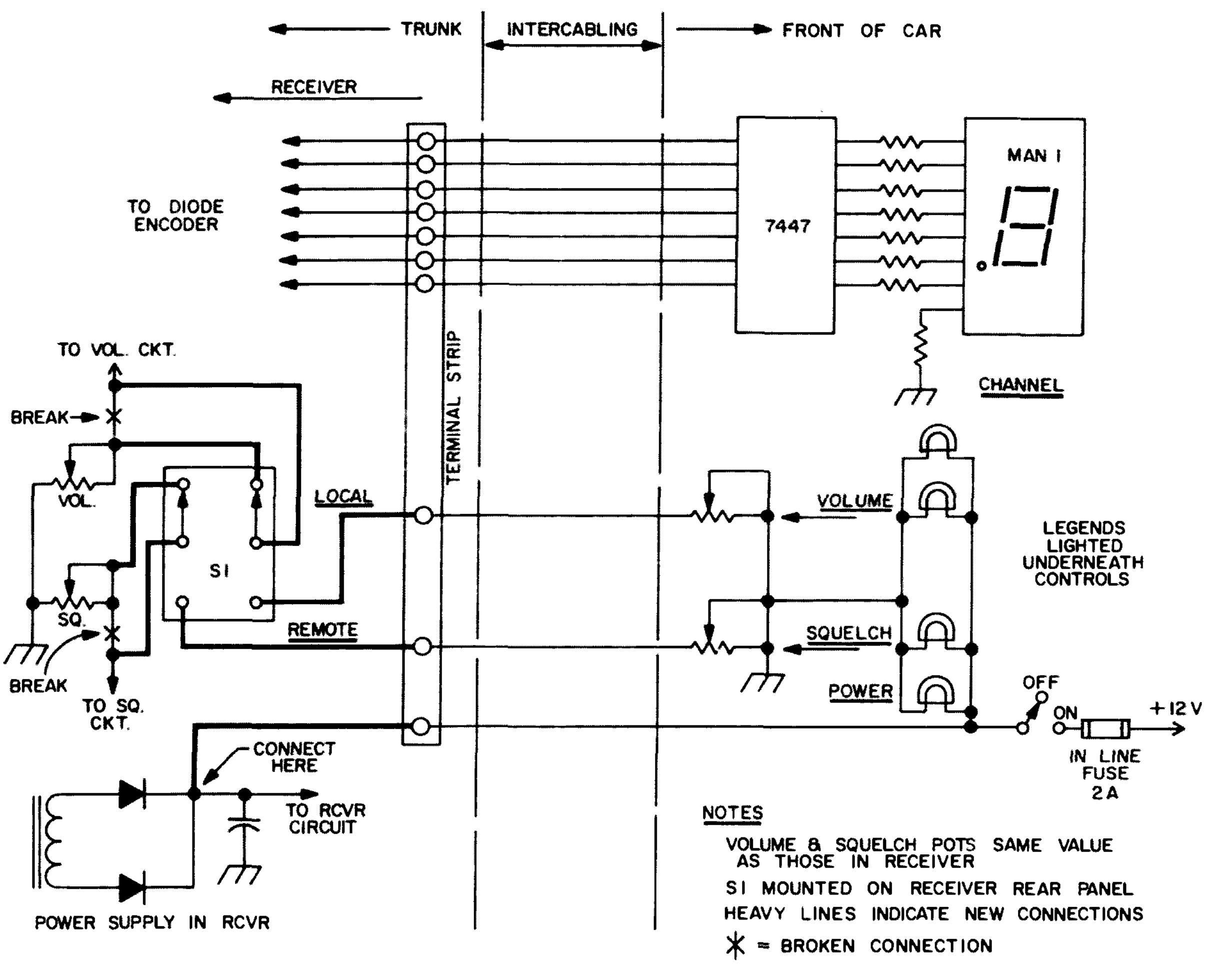

Fig. 2. Rear mount intercabling diagram for scanning receiver with dc type controls.

circuit more universally adaptable to any receiver. It is connected at the output of the filter in the power supply and mounted nearby.

A switch is incorporated for local-remote operation so that at any time the unit may be removed and used in the home or sold with no reduction in resale value. Basically, this switch removes any loading down of the circuit that would be caused by the remote controls. Wiring to and from this switch should be shielded to prevent hum pickup if the unit is operated from house current.

Basically, there are two different types of volume and squelch controls in various brands of receivers. The first of these we shall call the "dc type" (Fig. 2) where a transistor is used to gradually "turn off" the audio input to the af amplifier for control of volume, and a transistorized squelch amplifier is used to ground or unground the same line. Only two cable wires are needed to remote these functions, as seen in the diagram. This circuit is employed, for example, in the Electra BCIII receiver.

The second type is the "ac coupled" method where a more conventional L pad type of control is used (Fig. 3). Here, four cable wires are needed for remote application. The Realistic PRO 8A is an example.

In the latter cases, it may be more desirable to disconnect the internal speaker and, routing the hot lead to the front of the car, use a pad arrangement to attenuate the audio fed to the speaker (Fig. 4a). If much miniaturization is desired, this method will not be feasible because of the large physical size of the pot needed to handle two or three watts of power.

The encoding board inputs are connected directly to the output of the IC logic in the receiver. It is assumed here that when channel 1, for example, in your receiver is scanned, the output from the scanning cir-

cuit is logical 0 or ground. The circuit connects to a lamp or other indicator, the other side of which is connected to a permanently "high" or positive level. The indicator lights every time there is a path to ground as switched by the logic. If you have a receiver which uses the opposite logic (i.e., the "high" output turns on the indicators), connect the outputs to an inverter (SN 7404) and connect the inverter to the decoding inputs (diodes D1-19 must go turned around). The board itself may be mounted in any convenient location in the chassis.

The blanking input to the decoder needs some mention. When this line goes low or is grounded, the 7 segment readout is blanked. This line is normally high. If a point can be found in the receiver that goes high when the unit stops scanning and is low at other times, (i.e., in the squelch, logic or clock circuits), hook the lead to this point. It may be necessary to incorporate a diode to prevent the normal logically "high" level on this lead from disrupting circuit operation. If a point is found that goes low when a signal is received, use the circuit of Fig. 5 as an inverter to supply the needed low signal to the decoder BL input during scanning. This latter method will usually be the case. Any NPN transistor will work in this noncritical circuit.

A suitable plug or terminal strip should be mounted on the rear of the receiver and all connections routed to this. Keep a list of what wire goes to what pin or mark the chassis directly to avoid confusion later.

Panel

With all connections to the receiver made, a control panel must be made. There are various ways to do this but the most professional results will be had with the one described below. Basically, an unostentatious looking panel that would give no hint of the goodies in the trunk was desired. An

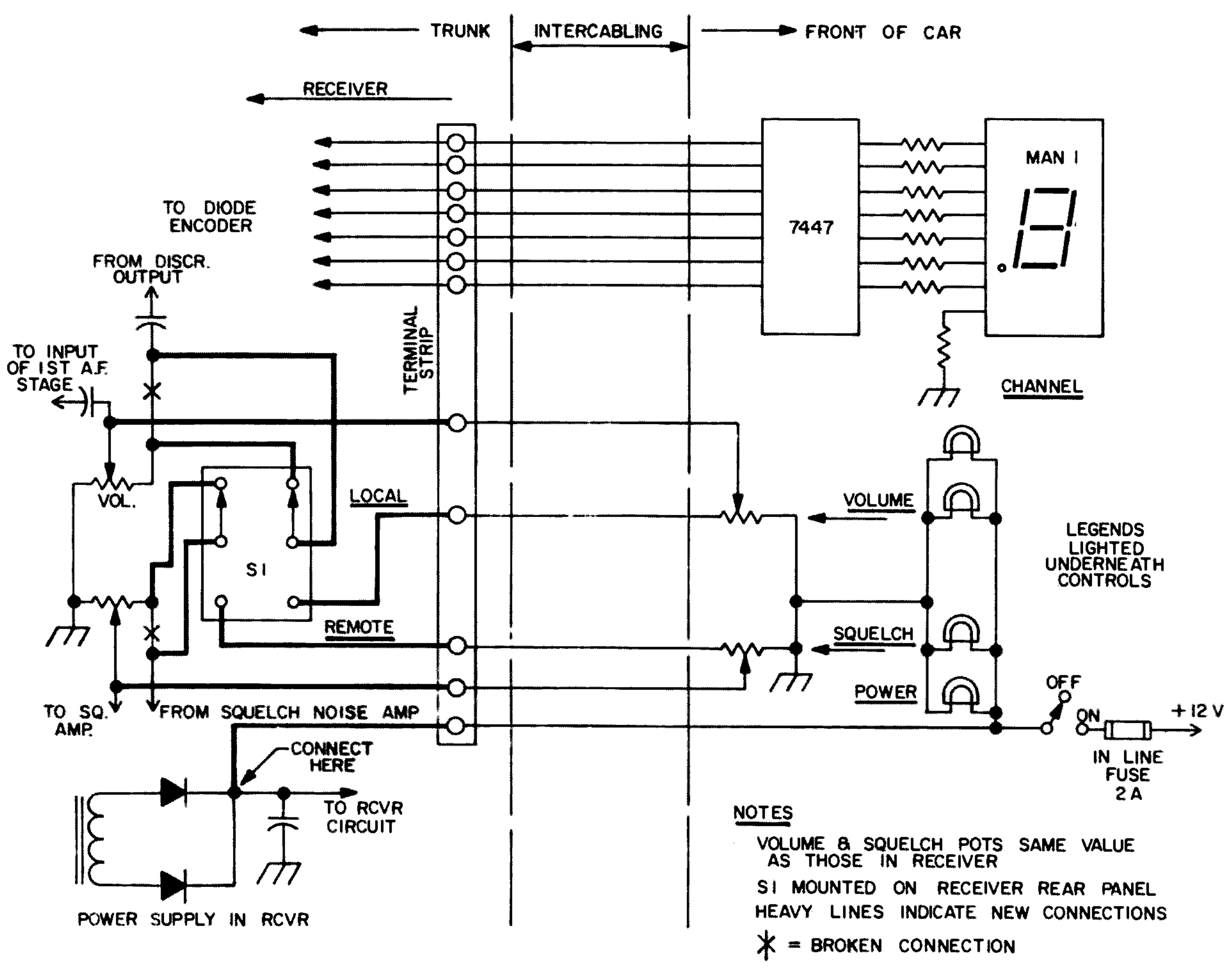

Fig. 3. Rear mount intercabling diagram for scanning receiver with ac type controls.

unmarked almost featureless panel was necessary. However, some method of identifying the different controls was needed when the unit was turned on.

Since dashboards are made from plastic these days, plastic seemed the material with which to work. A neater installation could be made, especially where there was any possibility of "drilling" a square hole, which, inevitably, comes out crooked. With a translucent panel many holes and markings would not be needed. The cutout for the optional air conditioning vents was measured and a piece of slightly oversized plastic cut to fit.

It was found that gray smoked plexiglass gives a block opaque look with no illumination behind it. When a LED or pilot lamp placed behind such material is turned on, the light is transmitted through the plastic with ease. Therefore, if a mask were made to block all but a certain shape of light, words and symbols could be formed by means of a single bulb.

Thus, a clear photo mask was laid out to the exact size of the panel. With various drafting aids such as Kepro or Bishop stick-ons, a black square was placed at the location of each readout and dry transfer

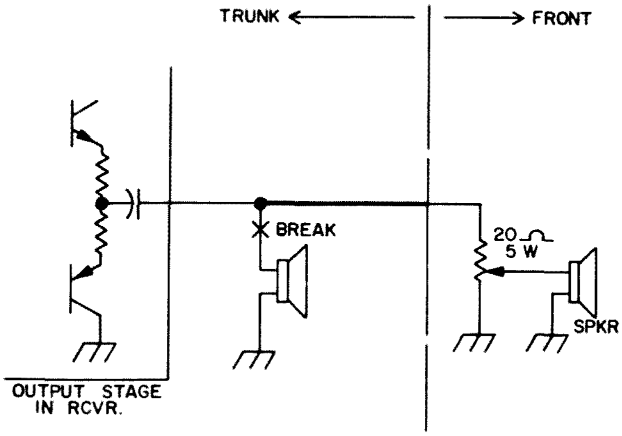

Fig. 4a. Speaker connections (optional).

lettering was placed below each control location and the readout square to indicate their respective function. This master layout was then taken to a photographer friend who reversed it full size (1:1) so that the lettering and readout space were now clear and the rest was opaque black. The material also had a sticky front with which it was

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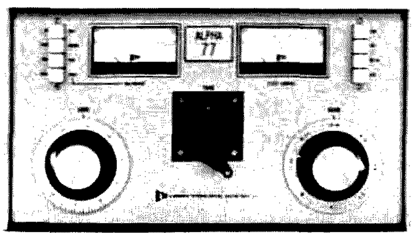

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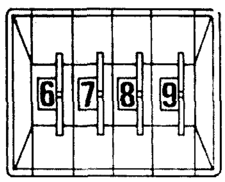

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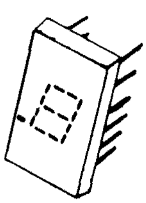

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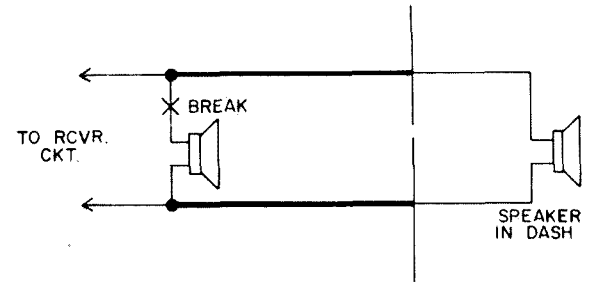

Fig. 4b. Speaker connections if no external jack available control of volume from Fig. 2 or 3.

attached to the rear of the plastic panel. Holes for the volume, squelch, and off-on switch were drilled and subminiature lights with pigtails (the type used for multiplex lights in Japanese stereo receivers) were cemented over or near each word. A cardboard shield was glued over each of them to

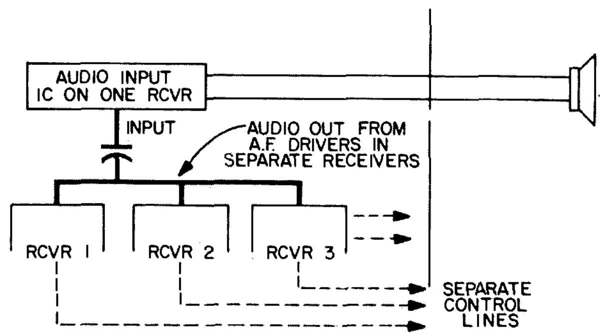

Fig. 4c. A method of using one speaker on several receivers to conserve space. Heavy lines are added wires.

prevent the reflection of light where it was not desired. The LED 7 segment readout was cemented to the clear space reserved for it on the panel and the indicator board with an IC socket mounted to it was plugged onto the back of the LED. Finally, the miniature surplus pots and subminiature switches were mounted and wired to a terminal strip cemented to the panel. The decoder pc board was cemented next to the terminal strip and wired to it and the LED indicator board.

The cable harness was run in the car wells and since a barrier type terminal strip was used on the receiver, the individual wires of the cable were attached to it. The other end was connected to the terminal strip and various connections at the panel. With a final check on loose ends and shorts power was applied, and presto – a professional looking

job. The panel remains dark, and looks uncluttered with only four knobs and two switches showing until the switches are turned on. Then the control functions flash into life below each knob and the panel

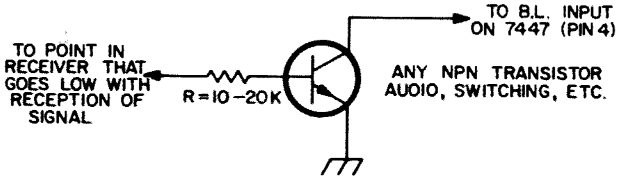

Fig. 5. Schematic of inverter to blank readout when receive is scanning. Use when no "Hi" or Logical 1 outputs are present (see text).

resembles a professionally made control center. The readout remains blank with only a dot showing until a signal is received, then a number appears in the space above the word "channel" indicating which frequency is being heard.

Comments

This is a simple, easy-to-use method that takes up a minimum of dashboard space. For those with a penchant for thoroughness and a larger amount of space, the seven segment readout may be dropped and a film made with the frequencies or names of whatever you listen to lettered on it, such as NYC PD, .94, .31–.91 RPT, etc. The scanner lights may be connected directly to bulbs behind these words and the resulting readout will show exactly what you are tuned to.

Speaker connections may be made as shown for each individual unit or, if the design of the car permits, the internal speaker from the receiver may be used and allowed to blare forth from its recessed location in the trunk.

Alternatively, the audio from all of the receivers may be fed (depending on the design of the units) into one receiver amplifying stage and one front speaker used. For transceiver connections, an additional switch to stop the logic clock in the receiver is mounted on the panel and microphone wires in the cable are soldered to a connector mounted on any available space on the panel or dashboard. When a signal is heard, the switch is depressed to stop the receiver from scanning until the QSO is completed.

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A CBer's GLOSSARY OF AMATEUR TERMINOLOGY

Andrew M. Cohn K4ADL
4823 West Braddock Road
Alexandria VA 22311

I wish to state at the outset that in addition to my sixteen years as a licensed amateur I have also retained authorization to communicate via the Citizens Radio Service.

During the past several years in the latter category, I must frankly admit acquaintance with many fine, honest, public-service-minded citizens band operators. I have also come upon a helluva load of dum-dums. It is to this group I address the ensuing glossary, with a view toward a general uplifting of technical prowess for this unfortunate element in our vital world of communications.

As there is an occasional need for continuity in our CBer's Glossary of Amateur Terminology, we hereby suspend the customary alphabetical order of things.

ARRL: Association for Rescue and Resuscitation of Llamas. (Clearly a useful organization)

Antenna: An insect who refuses to sing bass.

CW: Continuous Wave; as in . . . a continuous wave of malicious interference.

Frequency: How often a given act occurs;

for example, the *frequency* of on-the-air profanity.

Frequency Counter: A device – usually containing insufficient digits – for measuring the activities described above.

Deviation: An act in opposition with acceptable norms; e.g., the use of code names instead of call signs.

Discriminator: One who establishes communication with regard to race, color or creed.

Resistance: An unwillingness to comply; for example, with Part 95 regulations.

220 MHz: As in biblical times, "The Promised Band."

Prog Line: An unlikely story about progs. For example, "Warts come from touching progs."

Digital Logic: A particular method of making a point, or rendering a greeting to a CB'er.

Bug: A defect; e.g., a transmitter capable of only 5 watts input.

Joule: Opposite of Bug. Any 11 meter transmitter capable of more than 5 watts input. In common usage: "Mercy! This rig's a real joule."

Wheatstone Bridge: Connects Bronx with Queens.

Clapp Circuit: The area of 42nd Street between 6th and 10th Avenues and all of Brooklyn.

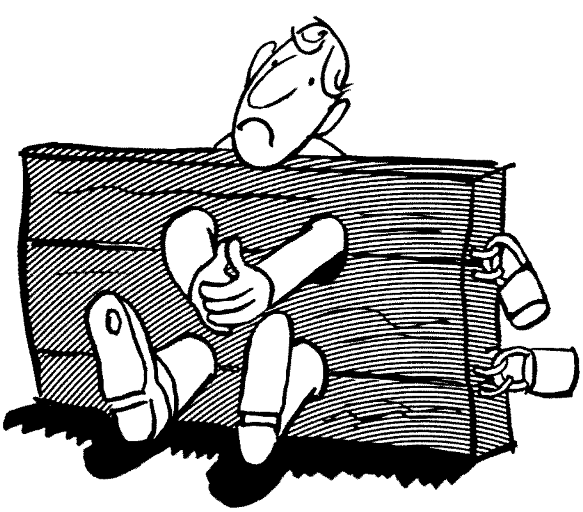
Half Wave: A greeting for someone you don't really like.

Squelch Tail: To make a long story short.

Autopatch: The process of repairing a vehicle.

Touch Pad: An apartment for encounter groups.

Repeater: A CB operator with more than one citation.



Linear Amplifier: A device "not intended for use on the 11 meter band."

PEP: "Promote Excessive Power." Motto of CB dealers stocking 11 meter linears.

Heterodying: The act of having dinner with a member of the opposite sex.

Hertz: An rf burn, or an FCC fine.

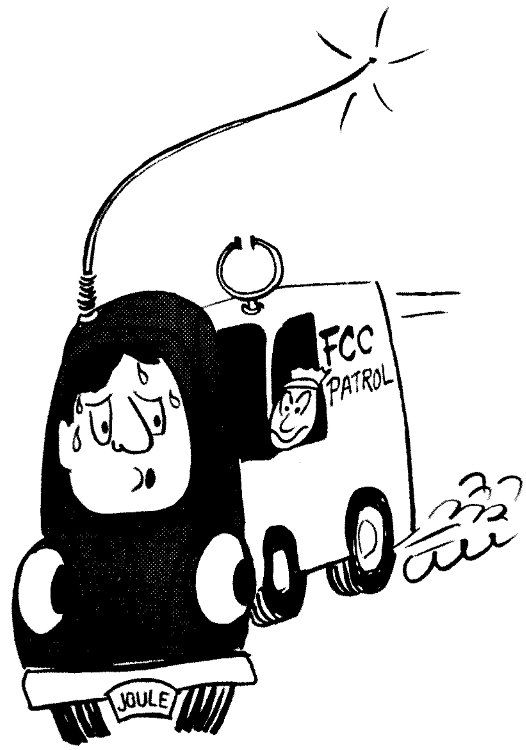
Zero Beat: A police officer suspended from duty.

Ohm's Law: Simply stated . . . "If you see a truck with revolving dome, you'd best pretend you're not at ohm.

Capture Effect: See Ohm's Law; the result of being found at ohm.

Split Channel: Something you should do when the FCC truck is spotted.

Kilowatt: The appropriate action to be



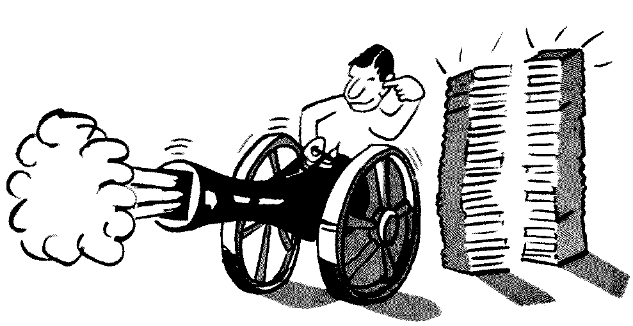
taken when running 6 watts on 11 meters while being followed by a strange truck with government tags.

Oven: When the heat's on, a good place to hide the linear.

Collinear: The result of placing the amplifier in the refrigerator rather than in the oven.

Skip: To avoid, or pass over. In common usage: "Mercy! This guy's calling from Texas! Let's not *skip* this one!"

73 Magazines: The approximate amount of



ammunition needed to control one square block of 11 meter deviates.

. . .K4ADL

Bill Lester WA9FGP
825 S. Grace St.
Lombard IL 60148

A TUNING HINT FOR RCA FM EQUIPMENT

Contrary to usual industry practice, RCA has designed its line of FM communications equipment to cover a broad frequency range. Normal practice in the two-way radio industry is to manufacture each radio to cover a narrow segment of frequencies within the general limits of the particular frequency band.

An example of this practice is seen in Motorola equipment which nominally covers the 30 to 50 MHz band. Motorola has split this band into three, (and sometimes four) segments; designated H (40 to 50 MHz), M (30 to 40 MHz) and L (25 to 30 MHz). Each segment requires a different tuned circuit. Therefore, unless the ham is lucky he must change coils and capacitors in order to convert the gear for use on the amateur band. This is an expensive and time consuming process.

RCA has eliminated this problem. Each rf coil has a tap to change the value according to a tuning table which is provided for each segment of the entire frequency range.

The table shown is reproduced from the manual covering an RCA transmitter used

TUNING CHART

OPER. FREQ MC	OSC. SCREEN JUMPERS See Note 10	271, 272 273 & 274 JUMPERS	2L7, 2L8 & 2L9 ACTIVE TURNS	SHUNT CAP.	FIN. PL. PADDER 2C54	APPROX. ACTIVE TURNS 2L12	2L13
25	1 to 2	1 to 3, 2 to 4	"	on	on	13 7/8	8 7/8
26			"			12 7/8	8 7/8
27			"			11 7/8	7 7/8
28			"			10 7/8	7 7/8
29	1 to 2	1 to 3, 2 to 4	"		on	9 7/8	7 7/8
30	t to 2, 3 to 4	1 to 3	8		off	13 7/8	7 7/8
31			8			12 7/8	7 1/8
32			8			11 7/8	7 1/8
33			8			11 1/8	6 7/8
34			8			10 7/8	6 7/8
35			8			9 7/8	6 7/8
36	1 to 2, 3 to 4	1 to 3	8	on		9 1/8	6 1/8
37	1 to 3	1 to 2, 3 to 4	"	off		8 7/8	5 7/8
38			"			8 7/8	5 1/8
39			"			7 7/8	5 1/8
40			"			7 7/8	5 1/8
41			"			7 1/8	5 1/8
42			"			6 7/8	4 7/8
43			"			6 7/3	4 7/8
44	1 to 3	1 to 2, 3 to 4	"			6 7/8	4 7/8
45	1 to 3, 2 to 4	1 to 2	8			6 1/8	4 7/8
46			8			6 1/8	4 7/8
47			8			5 7/8	4 1/8
48			8			5 1/8	3 7/8
49			8			4 7/8	3 7/8
50			8			4 7/8	3 7/8
51			8			4 7/8	3 7/8
52			8			4 1/8	3 7/8
53			8			4 1/8	3 1/8
54	1 to 3, 2 to 4	1 to 2	8	off	off	3 7/8	2 7/8

for operation in the 25 to 54 MHz range. To change the operating frequency from 33.05 MHz to 52.525 MHz, you would change jumpers according to the table, plug in your crystal and tune the transmitter in the normal manner. When a capacitor connection is to be changed, notes provided by RCA in each manual tell exactly where each component is stored when not in use.

There are two advantages for the ham with this system: First, you need not know the original operating frequency of the gear you are buying. Change jumpers and you are in business. Second, there are no expensive coils to buy, which means that you can shift all the way from six meters down to ten meters for only the cost of crystals. The RCA high-band (148–172 MHz) equipment has the same design advantages as the low-band equipment.

I hope that knowledge of this system will help you to better evaluate the goodies that show up at hamfests and surplus dealers. Manuals could probably be borrowed from the local two-way shop.

. . .WA9FGP

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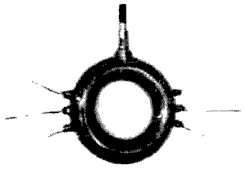

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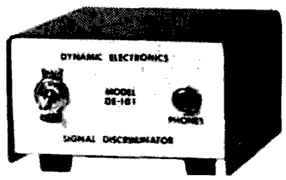

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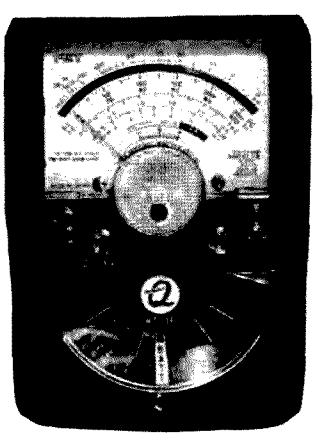

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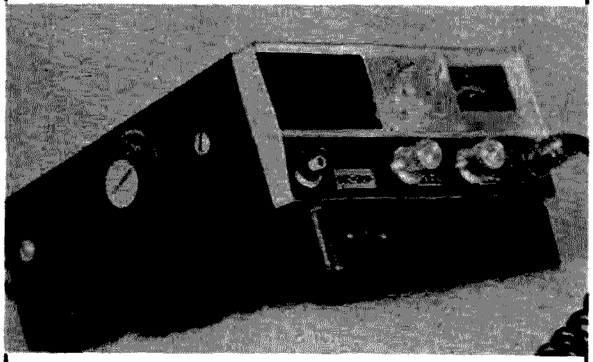

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This unit is a small, crystal-controlled, digital IC subaudible tone encoder. This unit can operate anywhere between 9 to 15 volts dc and is extremely stable in frequency over the entire voltage range and normal temperature range. The desired output frequency is readily obtainable by ordering the right frequency crystal from one of several manufacturers.

Circuit Description

The 65–240 kHz crystal is oscillated by the 2 transistor modified multi-vibrator circuit Q1, Q2. The output of this high

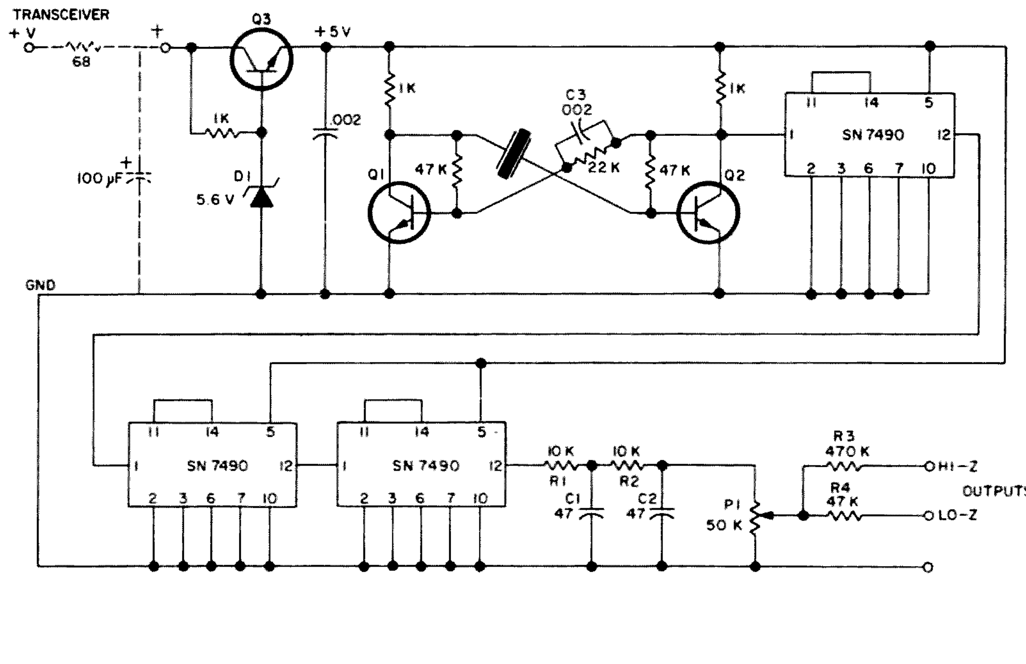

Fig. 1. Schematic of the sub-audible tone generator. Q1,2-MPS6513; Q3-2N1613

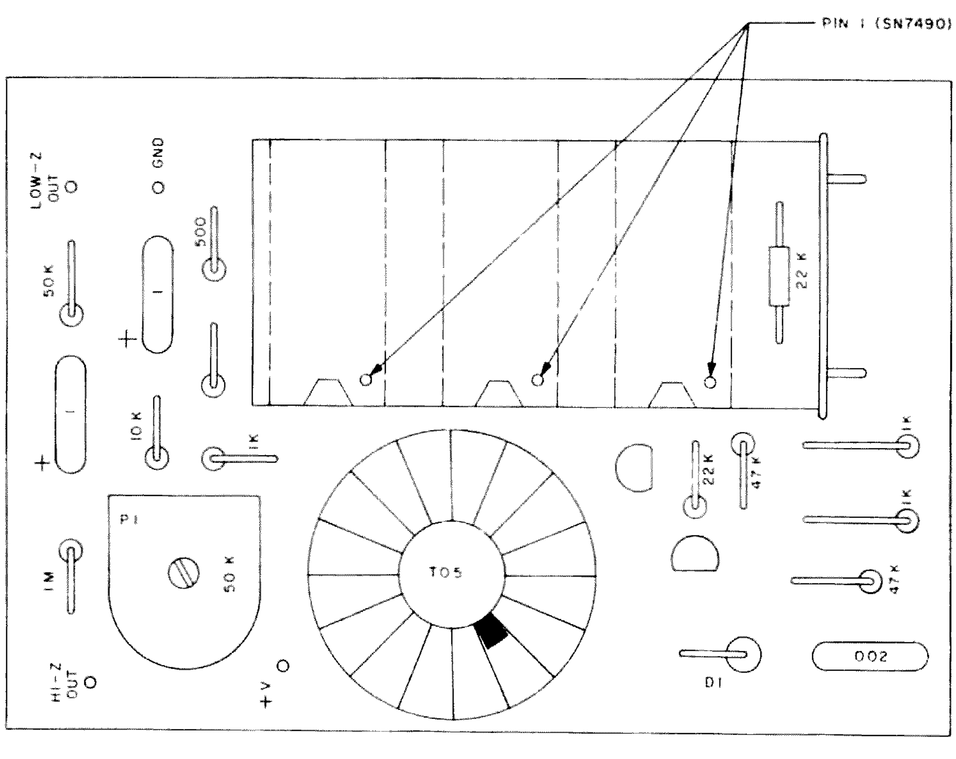

Fig. 2. Suggested parts layout for the tone generator.

frequency oscillator is then divided down to the 100 Hz range by the 3 SN7490 decade counters. The last counter output is the square wave of the desired subaudible frequency (65–240 Hz). This square wave is then filtered by the 2 stage RC filter network comprised of R1, R2, C1, C2. The output amplitude is then adjusted by the

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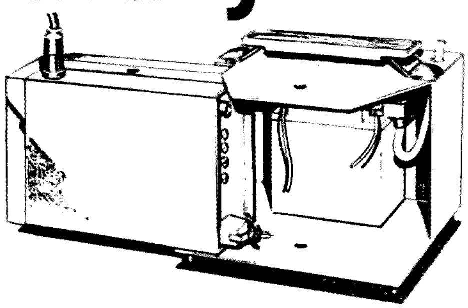

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50 K-ohm potentiometer. High impedance microphone circuits should be connected to the 1 megohm resistor R3 or for low impedance microphone inputs should be connected to the 50 Kohm resistor R4. Transistor Q3 and zendr diode CR1 regulate the supply voltage to the tone generator. The raw power supply can be from either a 9V transistor radio battery or connected to the +12–15 volt transceiver supply. In some instances, the tone generator will load the transceiver supply with the switching current ripple (i.e., when the output voltage pot is turned to zero, the

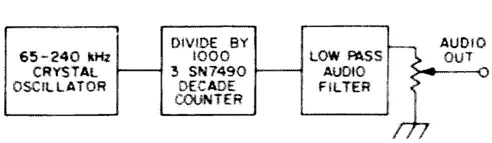

Fig. 3. Block diagram of the unit.

audio harmonics can still be heard on the transmitted signal). If this occurs, then the generator supply should be isolated with the 68Ω, 100 μF RC filter.

Test and Connection

To test the unit, connect the plus voltage lead to 9–15 volts and the ground wire to the return supply. Attach an earphone to the low impedance output and ground. When potentiometer P1 is maximum, the tone should easily be heard in the earphone. Once this tone is detected, you can assume that its frequency is the crystal frequency divided by 1000. To connect the unit to the transceiver, just run the audio output to the microphone input of the rig. The potentiometer P1 should be set at the minimum level to operate the repeater system reliably.

The encoder board can be mounted inside most transceivers. If desired, or necessity demands, the board can be placed inside a plastic box (a discarded or XYL borrowed dressmaker pin box is excellent). The boxed unit can then be "stuck" to the side of the rig with double-sided sticky foam tape.

. . .WA8YDC

FCC RULES AND REGULATIONS, PART 97 (IX)

Continuing from February, here is the last installment of the FCC Rules and Regulations pertaining to the Amateur Radio Service.

AUTHORITY: §§ 97.1 to 97.409 issued under 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303. Interpret or apply 48 Stat. 1064–1068, 1081–1105, as amended; 47 U.S.C. Sub-chap. I, III–VI.

§ 97.221 Permissible communications.

Stations in this service are authorized to transmit only the following types of civil defense communications:

(a) Communications for training purposes consisting of necessary drills and tests to insure establishment and maintenance of orderly and efficient operation of the radio amateur civil emergency networks and such other radio stations and networks as may be associated therewith for the conduct of civil defense communications, including communications directly concerned with the conduct of practice alerts, practice blackouts, practice mobilization, and other comparable situations as may be ordered or initiated by competent civil defense authority or by the United States governmental or military authority charged with the defense of the area concerned. All messages which are transmitted in connection with such drills, exercises and tests shall be clearly identified as such by use of any one of the words "Drill" or "Exercise" or "Test" in the body of such messages.

(b) Communications when there is an impending or actual condition jeopardizing the public safety or affecting the national defense or security:

(1) Communications directly concerning the activation of the radio amateur civil emergency station networks or such other radio stations and networks as may be associated with the networks for the conduct of civil defense communications.

(2) Communications directly concerning the conduct of service by the radio amateur civil emergency networks and such other radio stations and networks as may be associated therewith.

(3) Communications directly concerning safety of life, preservation of property, maintenance of law and order, alleviation of human suffering and need, and combating of armed attack or sabotage.

(4) Communications directly concerning the accumulation and dissemination of public information or instructions to the civilian population essential to the activities of the civil defense organization or that of other authorized governmental or relief agencies.

(5) Communications directly concerning the transaction of business essential to public welfare.

§ 97.223 Use of codes and ciphers.

Any station in this service is authorized to transmit messages in codes and ciphers and to utilize any method of secret or coded authentication of its transmissions when such method of concealing the contents of messages or such authentication procedure is prescribed by the competent civil defense authority of the area served by the station and is approved by the cognizant federal civil defense authorities.

§ 97.225 Priority of communications.

The order of priority of communications by stations in this service, when there is an impending or actual condition jeopardizing the public safety or affecting the defense or security of an area, shall be determined by the cognizant civil defense authority of the area concerned or his authorized representative.

§ 97.227 Operating procedure.

The operating procedure, and the method of circuit control by the control station of each network, shall be determined by the responsible civil defense authority of the area concerned and shall, in general, conform as nearly as possible to the operating procedure normally followed in other services in the expeditious handling of message traffic by the method of transmission in use.

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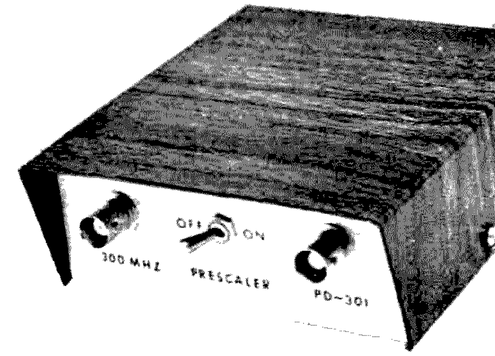

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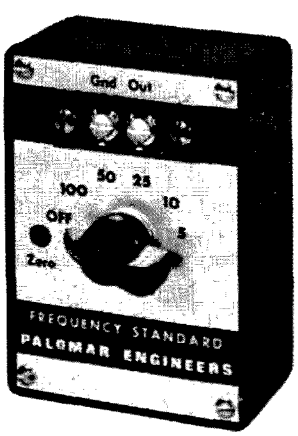

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Subpart G—Operation of Amateur Radio Stations in the United States by Aliens

§ 97.301 Basis, purpose, and scope.

(a) The rules in this subpart are based on, and are applicable solely to, alien amateur operations pursuant to section 303(1)(2) and 310(a) of the Communications Act of 1934, as amended. (See Public Law 88-313, 78 Stat. 202.)

(b) The purpose of this subpart is to implement Public Law 88-313 by prescribing the rules under which an alien, who holds an amateur operator and station license issued by his government (hereafter referred to as an alien amateur), may operate an amateur radio station in the United States, in its possessions, and in the Commonwealth of Puerto Rico (hereafter referred to only as the United States).

§ 97.303 Permit required.

(a) Before he may operate an amateur radio station in the United States, under the provisions of sections 303(1)(2) and 310(a) of the Communications Act of 1934, as amended, an alien amateur licensee must obtain a permit for such operation from the Federal Communications Commission. A permit for such operation shall be issued only to an alien holding a valid amateur operator and station authorization from his government, and only when there is in effect a bilateral agreement between the United States and that government for such operation on a reciprocal basis by United States amateur radio operators.

§ 97.305 Application for permit.

(a) Application for a permit shall be made on FCC Form 610-A. Form 610-A may be obtained from the Commission's Washington, D.C., office, from any of the Commission's field offices and, in some instances, from United States missions abroad.

(b) The application form shall be completed in full in English and signed by the applicant. A photocopy of the applicant's amateur operator and station license issued by his government shall be filed with the application. The Commission may require the applicant to furnish additional information. The application must be filed by mail or in person with the Federal Communications Commission, Washington, D.C., 20554, U.S.A. To allow sufficient time for processing, the application should be filed at least 60 days before the date on which the applicant desires to commence operation.

§ 97.307 Issuance of permit.

(a) The Commission may issue a permit to an alien amateur under such terms and conditions as it deems appropriate. If a change in the terms of a permit is desired, an application for modification of the permit is required. If operation beyond the expiration date of a permit is desired, an application for renewal of the permit is required. In any case in which the permittee has, in accordance with the provisions of this subpart, made a timely and sufficient application for renewal of an unexpired permit, such permit shall not expire until the application has been finally determined. Application for modification or for renewal of a permit shall be filed on FCC Form 610-A.

(b) The Commission, in its discretion, may deny any application for a permit under this subpart. If an application is denied, the applicant will be notified by letter. The applicant may, within 90 days of the mailing of such letter, request the Commission to reconsider its action.

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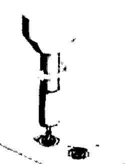

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(c) Normally, a permit will be issued to expire 1 year after issuance but in no event after the expiration of the license issued to the alien amateur by his government.

[*§ 97.307(a) amended eff. 12-15-72; VI(72)-1*]

§ 97.309 Modification, suspension, or cancellation of permit.

At any time the Commission may, in its discretion, modify, suspend, or cancel any permit issued under this subpart. In this event, the permittee will be notified of the Commission's action by letter mailed to his mailing address in the United States and the permittee shall comply immediately. A permittee may, within 90 days of the mailing of such letter, request the Commission to reconsider its action. The filing of a request for reconsideration shall not stay the effectiveness of that action, but the Commission may stay its action on its own motion.

§ 97.311 Operating conditions.

(a) The alien amateur may not under any circumstances begin operation until he has received a permit issued by the Commission.

(b) Operation of an amateur station by an alien amateur under a permit issued by the Commission must comply with all of the following:

(1) The terms of the bilateral agreement between the alien amateur's government and the government of the United States;

(2) The provisions of this subpart and of Subparts A through E of this part;

(3) The operating terms and conditions of the license issued to the alien amateur by his government; and

(4) Any further conditions specified on the permit issued by the Commission.

(c) An alien amateur may operate on dates, at locations, or via an itinerary, significantly different from that specified in the application for his permit only under the condition that he has given advance notice of the particulars of such operation to the Commission in accordance with the requirements of § 97.95(a).

§ 97.313 Station identification.

(a) The alien amateur shall identify his station as follows:

(1) Radio telegraph operation: The amateur shall transmit the call sign issued to him by the licensing country followed by a slant (/) sign and the United States amateur call sign prefix letter(s) and number appropriate to the location of his station.

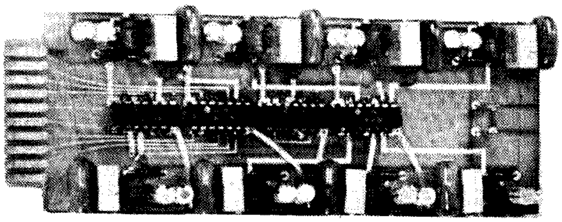
(2) Radiotelephone operation: The amateur shall transmit the call sign issued to him by the licensing country followed by the words "fixed", "portable" or "mobile", as appropriate, and the United States amateur call sign prefix letter(s) and number appropriate to the location of his station. The identification shall be made in the English language.

(b) At least once during each contact with another amateur station, the alien amateur shall indicate, in English, the geographical location of his station as nearly as possible by city and State, commonwealth, or possession.

Subpart H—Operation of Amateur Radio Stations in the United States by Permanent Resident Aliens

[*Subpart H (§§ 97.401–97.409) added new eff. 8-8-72; VI(72)-1*]

REPEATER ACCESSORIES



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§ 97.401 **Basis, purpose and scope.**

(a) The rules in this subpart are based on and are applicable solely to those provisions of section 303(l)(3) and 310(a) of the Communications Act of 1934, as amended (see Public Law 92–81, 85 Stat. and 78 Stat. 202) whereby certain aliens admitted to the United States for permanent residence should be eligible to operate amateur radio stations and to hold licenses for their stations.

(b) The purpose of this subpart is to implement Public Law 92–81 by prescribing the rules under which an alien, who is a permanent resident of the United States and has filed a declaration of intention with a State or Federal court may operate an amateur radio station in the United States.

§ 97.403 **License required.**

(a) Before an alien, under Public Law 92–81, may operate an amateur radio station in the United States under the provisions of sections 303(l)(3) and 301(a) of the Communications Act of 1934, as amended, he must obtain a license for such operation from the Federal Communications Commission. A license for such operation shall be issued only to an alien admitted to the United States for permanent residence who has filed under section 334(f) of the Immigration and Nationality Act (8 U.S.C. 1445(f) a declaration of intention to become a citizen of the United States and has successfully completed an examination pursuant to § 97.29.

§ 97.405 **Application for license.**

(a) Application for license shall be made on FCC Forms 610 and 610–C. Both forms may be obtained from the Commission's Washington, D.C., office or any of the Commission's field offices.

(b) The application forms shall be completed in full in English and signed by the applicant. The Commission may require the applicant to file additional information. Both applications must be filed in accordance with the instructions contained in §§ 97.11 and 97.41.

§ 97.407 **Issuance, modification, or cancellation of license.**

(a) The Commission may issue a license under such conditions, restrictions, and terms as it deems appropriate.

(b) At any time the Commission may, in its discretion, modify or cancel any license issued under this subpart. In this event, the licensee will be notified of the Commission's action by letter.

§ 97.409 **Operating conditions.**

(a) The alien applicant may not under any circumstances begin operation until he has received a license issued by the Commission.

(b) Except as stated in any condition the operational rules and procedure contained in Subparts A through E of this part shall be applicable.

(c) When the licensee under this subpart becomes a citizen of the United States it will not be necessary for him to notify the Commission of this fact until such time as the licensee desires to renew or modify his license. At the time the licensee becomes a citizen of the United States all procedural rights shall attach

to his license and the Communications Act and Administrative Procedure Act shall be applicable regarding any request or application for, or modification, suspension, or cancellation of, any such license.

APPENDICES

APPENDIX 1

EXAMINATION POINTS

Examinations for amateur radio operator licenses are conducted at the Commission's office in Washington, D.C., and at each field office of the Commission on the days designated by the Engineer in Charge of the office. Specific dates should be obtained from the Engineer in Charge of the nearest field office of the Commission.

Examinations are also given frequently, by appointment, at the Commission's offices at the following points:

Anchorage, Alaska.	San Diego, Calif.
Beaumont, Tex.	Savannah, Ga.
Mobile, Ala.	Tampa, Fla.

Examinations are also given at greater intervals at the places named below, which are visited for that purpose by Commission examiners from the field offices for such locations. For current schedules, exact time, place, and other details, inquiry should be addressed to the office conducting examinations at the chosen point.

QUARTERLY POINTS

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Des Moines, Iowa.	Salt Lake City, Utah.
Fort Wayne, Ind.	San Antonio, Tex.
Fresno, Calif.	Sioux Falls, S. Dak
Grand Rapids, Mich.	Syracuse, N.Y.
Indianapolis, Ind.	Tulsa, Okla.
Knoxville, Tenn.	Williamsport, Pa.
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Hartford, Conn.	Salem, Va.
Helena, Mont.	Spokane, Wash.
Jackson, Miss.	Tucson, Ariz.
Jacksonville, Fla.	Wichita, Kans.
Juneau, Alaska.	Wilmington, N.C.

ANNUAL

Bakersfield, Calif.	Klamath Falls, Oreg.
Bangor, Maine.	Lihue, Hawaii.
Billings, Mont.	Marquette, Mich.
Hilo, Hawaii.	Rapid City, S. Dak.
Jamestown, N. Dak.	Wailuku, Hawaii.

Arrangements have also been made, including cooperation of other Federal agencies, for General Class examinations in outlying areas as follows:

Guam: District Communications Officer, United States naval station.

Hawaii: At not exceeding one point on any island, by the Engineer in Charge (Honolulu).

[*Appendix 1, Helena, Mont., added to Semiannual Examination Points; Great Falls and Helena, Mont., deleted from Annual Examination Points eff. 2-21-73; VI(72)-2*]

APPENDIX 2

Extracts From Radio Regulations Annexed to the International Telecommunication Convention (Geneva, 1959)

ARTICLE 41—AMATEUR STATIONS

Section 1. Radiocommunications between amateur stations of different countries [1] shall be forbidden if the administration of one of the countries concerned has notified that it objects to such radiocommunications.

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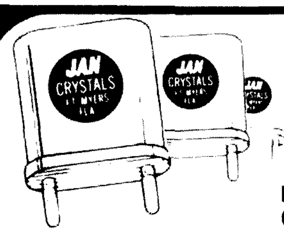

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SEC. 2. (1) When transmissions between amateur stations of different countries are permitted, they shall be made in plain language and shall be limited to messages of a technical nature relating to tests and to remarks of a personal character for which, by reason of their unimportance, recourse to the public telecommunications service is not justified. It is absolutely forbidden for amateur stations to be used for transmitting international communications on behalf of third parties.

(2) The preceding provisions may be modified by special arrangements between the administrations of the countries concerned.

SEC. 3. (1) Any person operating the apparatus of an amateur station shall have proved that he is able to send correctly by hand and to receive correctly by ear, texts in Morse code signals. Administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 144 MHz.

(2) Administrations shall take such measures as they judge necessary to verify the technical qualifications of any person operating the apparatus of an amateur station.

SEC. 4. The maximum power of amateur stations shall be fixed by the administrations concerned, having regard to the technical qualifications of the operators and to the conditions under which these stations are to work.

SEC. 5. (1) All the general rules of the Convention and of these Regulations shall apply to amateur stations. In particular, the emitted frequency shall be as stable and as free from spurious emissions as the state of technical development for such stations permits.

[1] As may appear in public notices issued by the Commission.

(2) During the course of their transmissions, amateur stations shall transmit their call sign at short intervals.

RESOLUTION NO. 10

Relating to the use of the bands 7000 to 7100 kHz and 7100 to 7300 kHz by the Amateur Service and the Broadcasting Service.

The Administrative Radio Conference, Geneva, 1959,

Considering—

(a) That the sharing of frequency bands by amateur, fixed, and broadcasting services is undesirable and should be avoided;

(b) That it is desirable to have worldwide exclusive allocations for these services in Band 7;

(c) That the band 7000 to 7100 kHz is allocated on a worldwide basis exclusively to the amateur service;

(d) That the band 7100 to 7300 kHz is allocated in Regions 1 and 3 to the broadcasting service and in Region 2 to the amateur service;

resolves,

that the broadcasting service should be prohibited from the band 7000 to 7100 kHz and that broadcasting stations operating on frequencies in this band should cease such operation;

and noting,

the provisions of No. 117 of the Radio Regulations;

further resolves,

that interregional amateur contacts should be only in the band 7000 to 7100 kHz and that the administrations should make every effort to ensure that the broadcasting service in the band 7100 to 7300 kHz, in Regions 1 and 3, does not cause interference to the amateur service in Region 2; such being consistent with the provisions of No. 117 of the Radio Regulations.

APPENDIX 4

Convention Between the United States of America and Canada, Relating to the Operation by Citizens of Either Country of Certain Radio Equipment or Stations in the Other Country
(Effective May 15, 1952)

ARTICLE III

It is agreed that persons holding appropriate amateur licenses issued by either country may operate their amateur stations in the territory of the other country under the following conditions:

(a) Each visiting amateur may be required to register and receive a permit before operating any amateur station licensed by his government.

(b) The visiting amateur will identify his station by:

(1) *Radiotelegraph operation.* The amateur call sign issued to him by the licensing country followed by a slant (/) sign and the amateur call sign prefix and call area number of the country he is visiting.

(2) *Radiotelephone operation.* The amateur call sign in English issued to him by the licensing country followed by the words, "fixed," "portable" or "mobile," as appropriate, and the amateur call sign prefix and call area number of the country he is visiting.

(c) Each amateur station shall indicate at least once during each contact with another station its geographical location as nearly as possible by city and state or city and province.

(d) In other respects the amateur station shall be operated in accordance with the laws and regulations of the country in which the station is temporarily located.

APPENDIX 5

DETERMINATION OF ANTENNA HEIGHT ABOVE AVERAGE TERRAIN

The effective height of the transmitting antenna shall be the height of the antenna's center of radiation above "average terrain." For this purpose "effective height" shall be established as follows:

(a) On a U.S. Geological Survey Map having a scale of 1:250,000, lay out eight evenly spaced radials, extending from the transmitter site to a distance of 10 miles and beginning at (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315° T.) If preferred, maps of greater scale may be used.

(b) By reference to the map contour lines, establish the ground elevation above mean sea level (AMSL) at 2, 4, 6, 8, and 10 miles from the antenna structure along each radial. If no elevation figure or contour line exists for any particular point, the nearest contour line elevation shall be employed.

(c) Calculate the arithmetic average of these 40 points of elevation (5 points of each of 8 radials).

(d) The height above average terrain of the antenna is thus the height AMSL of the antenna's center of radiation, minus the height of average terrain as calculated above.

NOTE 1: Where the transmitter is located near a large body of water, certain points of established elevation may fall over water. Where it is expected that service would be provided to land areas beyond the body of water, the points at water level in that direction should be included in the calculation of average elevation. Where it is expected that service would not be provided to land areas beyond the body of water, the points at water level should not be included in the average.

NOTE 2: In instances in which this procedure might provide unreasonable figures due to the unusual nature of the local terrain, applicant may provide additional data at his own discretion, and such data may be considered if deemed significant.

APPENDIX 3

CLASSIFICATION OF EMISSIONS

For convenient reference the tabulation below is extracted from the classification of typical emissions in Part 2 of the Commission's Rules and Regulations and in the Radio Regulations, Geneva, 1959, and it includes only those general classifications which appear most applicable to the Amateur Radio Service.

Type of modulation	Type of transmission	Symbol
Amplitude	With no modulation	A0
	Telegraph without the use of modulating audio frequency (by on-off keying).	A1
	Telegraphy by the on-off keying of an amplitude modulating audio frequency or audio frequencies or by the on-off keying of the modulated emission (special case: an unkeyed emission amplitude modulated).	A2
	Telephony	A3[1]
	Facsimile	A4
	Television	A5
Frequency (or phase).	Telegraphy by frequency shift keying without the use of a modulating audio frequency.	F1
	Telegraphy by the on-off keying of a frequency modulating audio frequency or by the on-off keying of frequency modulated emission (special case: an unkeyed emission frequency modulated).	F2
	Telephony	F3
	Facsimile	F4
	Television	F5
Pulse		P

[1] (In Part 97) unless specified otherwise, A3 includes single and double sideband with full, reduced, or suppressed carrier.

THE END

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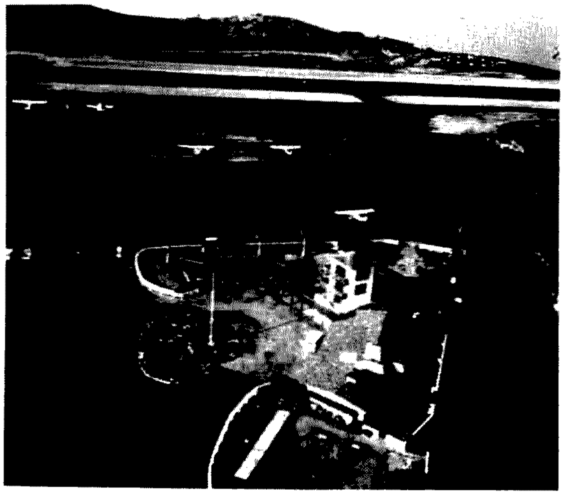
FIRST U.S. LICENSED REMOTE-CONTROLLED REPEATER

On 27 April, 1973, the country's first licensed remotely controlled repeater came on the air with a 10-watt voice from Catalina Island, and more than 200 Southern California and Mexican amateurs tried out its 13,000 square mile coverage.

Located on an island, the new WR6 AAA repeater had several obstacles to overcome before it was ready for service. First, the island of Catalina is privately owned by the Wrigley (chewing gum) family, which meant designing an installation under some conditional constraints of the lease. Then, there is the problem of transportation. Everything going to or from the island must be transported either by boat or by aircraft. In fact, it was this aspect of private flying that actually sparked the creation of the "AAA" repeater.

Catalina Island is not heavily populated; only about 1500 full-time residents share the 18-mile-long by 7-mile-wide island with some wild goats, numerous wild boar, and a herd of buffalo. The island is located 26 miles off the Southern California Coast, giving it a view of the mainland north to Santa Barbara, south to San Diego and Mexico, and inland to the San Bernardino Mountains.

The island itself is mountainous, with the terrain covered by thick chaparral growth and some scrub oak. Private pilots are keenly



Catalina Island's "Airport in the Sky"

aware of the topographic elevation of the island's "airport in the sky." Catalina Airport is 1,560 feet above sea level. There is a unique thrill finding yourself at 2,000 feet altitude over the water when you have left the runway just seconds before. It is this unusual airport location that brought private pilots to the service of amateur radio.

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2N4091 TYPE RF Amp & Switch (TO-106)	3/$1.00
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The idea of a repeater on Catalina started more than two years ago when Dave Corsiglia WA6TWF, working as a flight instructor, would occasionally visit the airport in the sky with student pilots. On several of these trips, he found that he was able to work San Diego as well as the greater Los Angeles area with a 2-watt hand-held from the base of the control tower. He decided to pursue the idea of an airport-located repeater, and obtained a lease from the Catalina Island Company with the help of Ms. Debby Klapper, a student pilot and friend of the airport manager.

Next came the task of gathering financial support. Several clubs in the Los Angeles area were contacted, but all were skeptical. One club's "engineer" even said that he knew it would never work because he had tried to install a repeater for the Government in the 1950's and had failed because of the local temperature inversion. Strangely enough, instead of a hindrance, this weather phenomenon of the temperature inversion layer has so far seemed to be a great help to propagation.

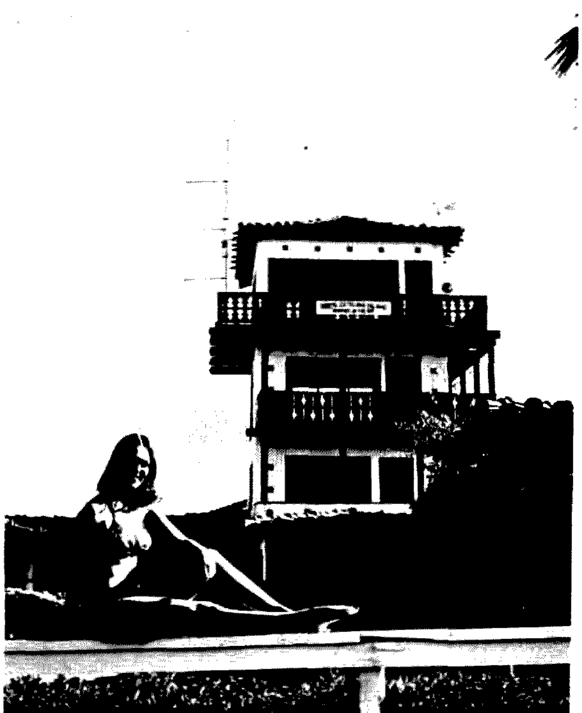
Undaunted by the skeptics, Dave continued his efforts and formed the Catalina

Catalina Island Repeater Club with equipment by Henry Radio.

Island Repeater Club. However, they were still unable to raise sufficient financial support until Sam Niles W6CXW, volunteered to talk to his employer, Ted Henry of Henry Radio. Ted agreed to sponsor the repeater.

The next step was to apply for the repeater station license and to design the system. I had some limited experience with FCC applications, so this is where I got into the program. Being a private pilot too, this also added to the transportation availability out to the island. Working together with Sam Ferraro W3VGU, of the FCC's Washington Office, we were able to obtain our station license, complete to the gain antenna and the radio remote control. Special thanks to Sam for his patience in this aspect.

The design of the system required careful consideration for reliability; an island 26 miles off the coast is not exactly handy for service calls. For this reason, plus the history of successful operation of the Standard repeater, WR6AAC WA6ZZE, an all solid-state design was selected. The system would consist of a Standard Radio model RPT-1, several Tempo Commercial Line transceivers for control, a TPL 80-watt power amplifier with a fan (installed later), a Cushcraft colinear antenna, and a Phelps-Dodge 506-509 duplexer. The control tone circuitry was custom designed. After final assembly and test, the repeater and duplexer were fine-tuned by Roland Souci WA6EGZ, who designed the repeater for Standard.



Catalina Airport Control Tower.

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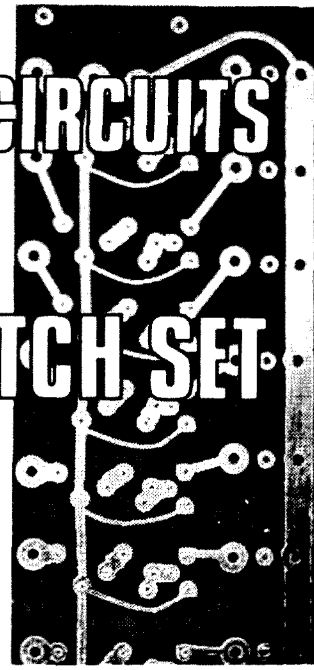

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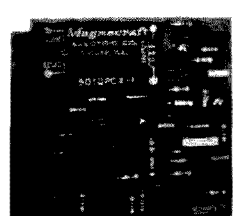

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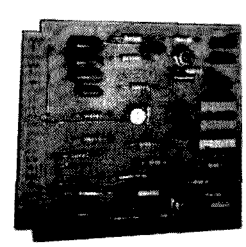

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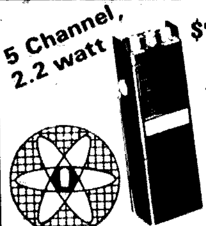
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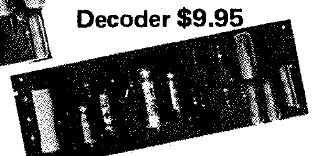
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After a week of checkout operation from Orange, California, the 4-foot pack plus accessories was ready to move out to the island to the top of the Catalina Airport control tower. Dave Corsiglia WA6TWF, Bob Swenson W6HIL, Rick Moore WB6FXF, Sam Niles W6CXW, and I loaded up two aircraft on the morning of 27 April and waited for the fog to clear at Catalina. At about 10:30, the island cleared just long enough for us to land, and then it closed in again.

Paul White WA6NUA, Assistant Manager of the Airport, was on hand to help us haul the equipment to the top of the tower by way of a rope line over the side. Then we connected the power. This was when we discovered another constraint – a minor clause in the lease agreement which said that the total antenna height should not exceed five feet because it would conflict with the aesthetics of the building. It should be pointed out here that the Catalina Airport is indeed a beautiful piece of architecture in the traditional Southern California old--Spanish-mansion style, which blends nicely with its environment. A not-beautiful antenna would certainly disrupt the aesthetics.

The remote control link antenna posed no problem. This ll-element beam antenna was installed inside the building, on the ceiling. The main antenna, however, would be another design challenge.

Our return trip was a real lesson in instrument flying and zero-zero takeoff. With the white line on the runway barely visible, we pushed our way through the fog and within 30 seconds were over the water, back in the sunshine. . .but still worrying about how to design an aesthetically pleasing antenna that would still perform well when mounted to the side of the control tower.

George Campbell W6FXZ, an antenna engineer and a new 2m FM enthusiast, was contacted and he agreed to take on the antenna design task. His first design consisted of two 2-element, end-fire, colinear arrays, fed 90° to provide a cardioid pattern. This antenna was installed and produced satifactory results.

George soon discovered that this first design did not cover San Diego as well as he had hoped, so he designed and built a

second antenna for the repeater system. As shown in the photographs, the antenna is about 13 feet long overall, consisting of two 3-element, colinear arrays spaced at 135°, and driven 45° out of phase to produce a modified cardioid pattern shaped (appropriately for Southern California) much like the ears on a Mickey Mouse hat.

The second array design proved to work much better. The antenna develops 7.5 dB gain ±45° off center and approximately 5.5 dB at center. Total 3 dB beamwidth is 180°. The dipoles used to construct the antenna were taken from the original Cushcraft hardware.

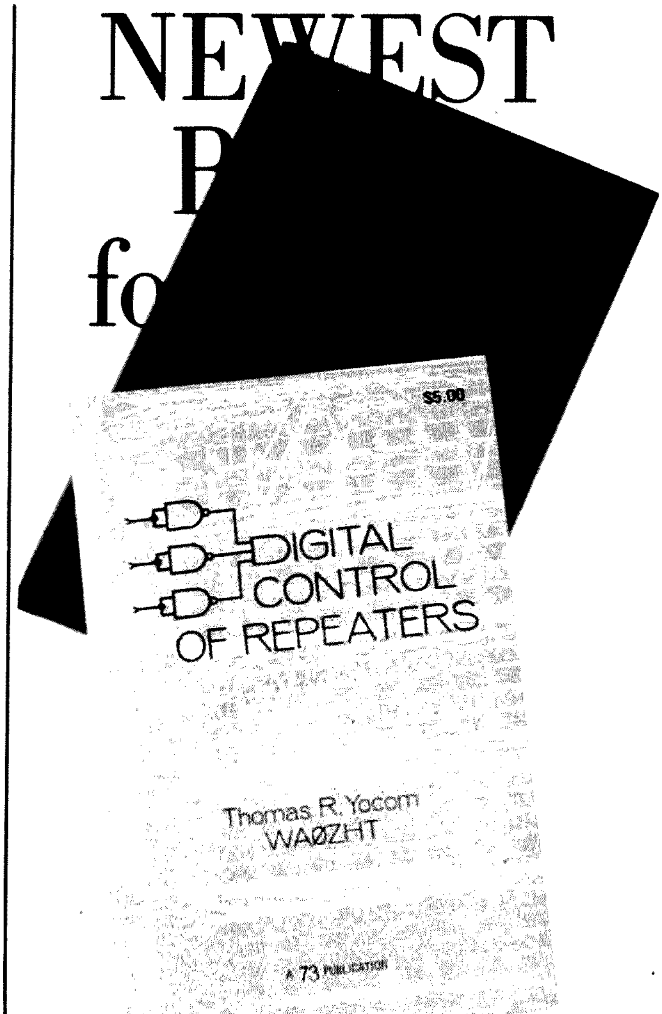
With satisfactory operation of the antenna established, a TPL power amplifier was installed to bring the ERP up to the allowed 100 watts. Operation of the system has been outstanding; only one service call has been required in eight months of operation. Planned later additions to the repeater system include a battery backup for emergency operation.

Remote control and monitoring of the repeater is accomplished from five control points in the Orange County, California area on a shared-time basis. Each day is broken into four time segments. Bill Davis WB6YHP, handles service from 6AM until noon, when Rick Moore WB6FXF, covers until 6PM, then Bob Swenson W6HIL, operates until midnight, when my call letters K6BIG, are behind the control until 6AM. Dave Corsiglia WA6TWF, acts as backup in the event of equipment failure or operator commitments.

Operation of the WR6AAA repeater system has proven to be a real help to Southern California amateur operators. More than 600 different calls have been logged to date and the repeater's record of continually improved performance attests to its fine operation.

We wish to thank everyone who has graciously supplied their time to the "AAA" project, particularly the people involved with the antenna installation, and to Jerry Vanderville (the new Catalina Airport Manager) for his patience and understanding, and especially to Henry Radio for their support of the program.

K6BIG



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			6.20-6.76
WR4ACB	Birmingham		6.16-6.76
			6.13-6.76
WR4ADD	Birmingham		6.34-6.94
WR4ACK	Decatur		6.40-7.00
W4ZBA	Demopolis	W1.8	6.34-6.94
		W1.8	52.760-52.525
			449.00-444.00
K4HAB	Dothan	W1.8	6.34-6.94
WR4ADJ	Florence		6.01-6.61
K4IQU	Huntsville		6.34-6.94
K4SPP	Huntsville		6.46-7.54
WA4UAG	Huntsville		5.992-7.120
W4QEE	Mobile		6.22-6.82
WB4QEV	Mobile		6.34-6.94
W4MWF	Montgomery		6.16-6.76
WB4QGL	Montgomery		6.34-6.94
WB4QFR	Phenix City	T1.8	6.28-6.88
ALASKA			
	Anchorage		6.34-6.94
KL7GNG	Fairbanks		6.34-6.94
KL7USA	Fairbanks		6.28-6.88
	Nome		6.34-6.94
ARIZONA			
WA7HUH	Globe		CLOSED
WA7KUM	Globe		CLOSED
K7EIK	Kingman	T1.8	6.16-6.76
			6.34-6.94
W7OAY	Phoenix		52.576-52.525
WR7ABQ	Phoenix		6.16-6.76
			6.34-6.94
WR7ABR	Phoenix		6.04-6.64
WR7ABS	Phoenix		449.30-445.30
WR7ABT	Phoenix		6.22-6.82
W7AJU	Prescott		CLOSED
WA7KYT	Sierra Vista		CLOSED
WA7KZW	Tucson		6.16-6.76
WR7ABH	Tucson		6.28-6.88
ARKANSAS			
WA5YUR	Asadown		6.22-6.82
WA5SNO	Fayetteville		6.16-6.76
			52.550-53.020
WB5FKF	Forrest		6.16-6.76
WA5YUT	Ft. Smith		6.34-6.94
WA5BRT	Hot Springs		6.28-6.88
W5RHL	Jonesboro		6.34-6.94
W5DI	Little Rock		6.34-6.94
W5TEF	Springdale		6.10-6.70
CALIFORNIA			
W6CX	Alamo		7.80-7.06
WR6ACB	Anaheim		6.19-6.79
K6KDU	Auburn		CLOSED
WA6ZSR	Bakersfield		6.07-6.67
WR6ACT	Barstow (Edwards AFB)	T1.8	6.16-6.76
WR6ACG	Bishop		6.34-6.94
W6IWY	Canoga Park		7.66-7.06
W6TI	Castro Valley		7.96-7.18
			7.00-7.34
WR6AAA	Catalina Island		7.69-7.09
WR6ADD	El Segundo (RACES)		7.72-7.12
WB6DGJ	Eureka		6.34-6.94
			6.94-7.48
WA6ICB	Eureka		52.760-52.525
W6JPU	Fresno		6.12-7.71
			6.85-7.71
			51.725-51.125
			448.00-449.93
WR6ACU	Fresno		6.34-6.94
K6OEH	Fullerton	T2.1	6.28-6.88
WA6IRY	Garden Grove		7.60-7.00
WA6UGS	Grass Valley		6.34-6.94
WB6OEO	Grizzly Peak	T1.95	7.00-6.34
WA6PPS	Hollywood Hills		7.90-7.30
WR6ABB	Hollywood Hills		6.01-6.61
WA6TWF	Huntington		7.69-7.09
WA6FLL	Johnstone Peak (FAX)		7.99-7.39
WR6ACD	Johnstone Peak		6.22-6.82
			222.38-223.98
WA6ZOF	Kentfield		CLOSED
WB6SZO	Long Beach		6.37-6.97
W6DOO	Los Altos		6.85-7.71
WB6VQD	Los Altos		6.31-6.91
K6CPT	Los Angeles		7.87-7.27
W6GY	Los Angeles		7.63-7.03
WA6LNU	Los Angeles (AM)		222.20-223.00
K6MYK	Los Angeles		7.84-7.24
WA6NTW	Los Angeles		222.34-223.94
K6ROC	Los Angeles		CLOSED
WA6TOD	Los Angeles		7.435-6.40
			7.405
WA6VFO	Los Angeles		7.78-7.18
WR6AAE	Los Angeles		6.22-6.82
WR6ABA	Los Angeles		7.81-7.21
WR6ABB	Los Angeles		6.01-6.61
WR6ABC			CLOSED
WR6ABI	Los Angeles		7.60-7.00
WR6ABJ	Los Angeles		6.07-6.67
			223.26-224.86
WR6ABT	Los Angeles (West)		6.19-6.79
WR6ABV	Los Angeles		7.78-7.18
WR6ABU	Los Angeles		7.66-7.06
WR6ABW	Los Angeles		7.60-7.00
WR6ACA	Los Angeles (RTTY)		6.10-6.70
WR6ACD	Los Angeles		6.22-6.82
WR6ACJ	Los Angeles		6.25-6.85
WR6ACE	McKittrick		6.31-6.91
WB6EMJ	Merced		6.06-6.76
WA6ZOD	Monterey		6.37-6.97
WR6ADH	Monterey Park	T1.8	7.87-7.27
WR6ABQ	Mt. Disappointment		7.87-7.27
WR6ABN	Mt. Lee		7.84-7.24
W6NWG	Mt. Palomar		6.13-6.73
WR6ACY	Mt. Palomar		7.99-7.39
W6AEX	Mt. Vaca		CLOSED
WB6WYI	Mt. Vaca		51.600-51.000
WR6AAD	Mt. Wilson		7.96-7.36
WA6IRY	Mt. Wilson		7.60-7.00
WR6ABE	Mt. Wilson		7.425-6.40
WR6ABF	Mt. Wilson		7.435-6.40
W6FHF	Norwalk		CLOSED
WA6ZNL	Norwalk		CLOSED
WB6ZRR	Novato		6.40-5.47
WB6NDJ	Oakland		6.28-6.88
			51.700-51.075
			50.400-51.070
K6SWS	Oakland	T1.8	6.34-6.94
WR6ABM	Oakland		6.22-6.82
			449.5-444.5
K6YUY	Oroville		6.34-6.94
WB6GUA	Palmdale		6.34-6.94
WR6ADA	Palm Springs		6.34-6.94
WA6TSM	Palo Alto		6.13-6.73
WA6YCZ	Palo Alto		6.85-7.71
W6RBW	Palos Verdes		7.66-7.06
WB6SLC	Palos Verdes		6.16-6.76
WB6ZON	Palos Verdes		CLOSED
WR6AAC/6	Palos Verdes		6.37-6.97
WR6ABO	Palos Verdes		6.34-6.94
W6ECE	Paradise		7.00-6.49
WB6SXC	Petaluma		5.98-6.90
			448.60-443.60
W6AOE	Pine Cove		7.75-7.15
K6QFQ	Pise Hill		6.25-6.85
WB6RSK	Pomona Valley		6.13-6.73
K6MIA	Redding		5.22-7.20
W6GDD	Rio Linda		6.34-6.94
WA6UGY	Rio Linda		6.49-7.00
K6ZCE	Riverside		6.16-6.76
WA6ZYM	Riverside		6.28-6.88
WA6ZZR	Riverside		6.16-6.76
WA6ZSM	Running Springs		6.31-6.91
WA6AJU	Sacramento		6.43-7.66
WA6JCW	Sacramento		CLOSED
WA6RYO	Sacramento		6.34-6.94
			449.10-444.10
WA6UGR	Sacramento		CLOSED
WB6ZOI	Sacramento		6.16-6.76
K4TXK/6	Sacramento		52.760-52.525
			52.880-52.525
WR6ACA	Saddle Peak (RTTY)		6.10-6.70
W6AGU	Salinas		6.60-7.60
WA6ALV	San Bernadino		6.25-6.85
			223.26-224.86
WA6ZYN	San Bernadino		6.28-6.88
WA6BTH	San Bruno		51.900-51.350
WA6KSB	San Diego		7.93-7.33
WR6ACF	San Diego		6.04-6.64
W6IN	San Fernando		6.13-6.73
W6WX	San Francisco		7.96-7.18
WA6ILA	San Joaquin		6.37-6.97
WR6ABD	San Jose		6.04-6.64
WB6TSO	San Luis Obispo		6.22-6.82
K6GWE	San Rafael		6.10-6.70
			448.25-443.25
WA6UGM	San Rafael		CLOSED
K6YDQ/K6UGP	Santa Ana		7.96-7.36
WB6IYW	Santa Barbara		6.31-6.91
WB6RYX	Santa Barbara (RACES)		7.325-7.00
WB6IAG	Santa Clara	T2.55	6.34-6.94
WB6LJR	Santa Clara		CLOSED
WB6OOS	Santa Clara		6.16-6.76
			449.60-444.60
WA6FLH	Santa Monica		6.07-6.87
WR6ACK	Santa Monica		7.93-7.33
WB6ZRQ	Sierra Peak		CLOSED
K6ZXZ	Simi		6.22-6.82
WR6ACV	Stocton		6.28-6.88
WA6SIN	Sulfur Mountain	T1.95	6.28-6.88
W6ZGC	Table Mountain	T2.1	6.16-6.76
W6QFK	Temple City		7.72-7.12
WA6TIC	Van Nuys		6.10-6.70
WB6IWF	Ventura	T1.95	6.25-6.85
WB6SLC	Wilmington		6.16-6.76
WR6ABX	Woodland		6.37-8.97
W6ZGC	Wrightwood	T2.1	6.16-6.76
COLORADO			
WØIA	Boulder	T1.8	6.16-6.76
			444.55-449.55
WAØFTM	Broomfield		6.01-6.61
			444.40-449.40
WBØERV	Buckhorn		6.25-6.85
WØJGL	Castle Rock		6.07-6.67
			443.50-448.70
WAØBAG	Colorado Springs		6.16-6.76
WAØVTT	Colorado Springs		6.16-6.76
WAØVTV	Colorado Springs		6.37-6.97
WAØNVU	Denver		CLOSED
KØOVQ	Denver		6.82-7.30
WAØVVC	Denver		444.35-449.35
WØWYX	Denver		6.16-6.76
			6.34-6.94
			53.500-53.525
			445.45-449.45
WRØABF	Denver (Squaw Mountain)		6.34-6.94
WRØABG	Denver		444.45-449.49
WRØACL	Denver		6.28-6.88
WRØACM	Denver		6.04-6.64
			444.60-449.60
WAØKXD	Fremont		6.22-6.82
WØPRZ	Grand Junction		5.32-6.94
WAØVVX	Loveland		6.25-6.85
WAØSNO	Pueblo		6.28-6.88
			6.34-6.94
	Pueblo		6.19-6.79
WAØZCI	San Luis		6.16-6.76
CONNECTICUT			
WR1ABM	Avon		6.28-6.88
WR1ABE	Bridgeport		6.295-6.895
WR1AAD	Canton		7.96-7.36
WA1KGB	Farmington		6.37-6.97
W1EOR	Glastonbury		5.47-7.09
WA1KHA	Hartford		6.04-6.64
WR1ACD	Monroe		6.235-6.835
WA1PXN	Naugabuck		7.78-7.18
WR1ABT	New Haven		6.01-6.61
WR1ABD	New London		6.07-6.67
W1WHZ	Norwalk		7.99-7.39
WR1AAF	Oxford		7.48-6.49
W1COO	Ridgefield		441.85-446.85
WA1PXO	Roxbury		7.72-7.12
WR1ABA	Simsbury		6.22-6.82
WR1ABR	Stamford		6.055-6.655
WA1KGY	Torrington		6.25-6.85
WA1KGO	Vernon		6.19-6.78
			52.760-52.525
			443.30-448.30
			221.38-224.38

DELAWARE

WA3KWE	Delmar		6.22-6.82
WA3FRH	Wilmington		6.13-6.73

FLORIDA

WR4ACV	Boca Raton		6.22-6.82
WR4ADC	Daytona Beach		6.34-6.94
W4AB	Ft. Lauderdale		6.22-6.82
WB4EQU	Ft. Walton Beach	W1.8	29.440-29.640
WB4KLT	Ft. Walton Beach	T1.8	6.19-6.79
WR4AAF	Jacksonville		6.16-6.76
			52.700-52.640
WB4KNO	Merritt Island		6.28-6.88
WB4HAA	Miami		6.16-6.76
WB4JJD	Ocala		6.01-6.61
WB4CLK	Okeechobee		6.34-6.94
WB4DEL	Orlando		6.16-6.76
			6.34-6.76
WR4AER	Orlando		7.12-7.72
			444.50-449.50
WB4QFY	Palm Beach		6.22-6.82
WB4QER	Panama City	W2.0	6.34-6.76
WR4ACZ	Pensacola		6.16-6.76
W4AFS	Pompano Beach		6.04-7.03
WB4IES	St. Petersburg		CLOSED
	Tallahassee		6.34-6.76
WB4HAE	Tampa		6.34-6.76
WB4QEN	Tampa		441.10-449.10
			444.10-449.10
			449.10-448.10

GEORGIA

WR4ADM	Albany		6.22-6.82
	Athens		6.13-6.73
W4BOC	Atlanta	T1.8	6.16-6.76
			6.34-6.76
WB4NST	Atlanta		CLOSED
WB4QGF	Atlanta		444.50-449.50
WB4WST	Atlanta		6.34-6.76
WR4AAE	Atlanta		6.22-6.82
WR4ABC	Atlanta		6.37-6.97
WR4ABN	Atlanta		7.63-7.03
WB4KLM	Augusta		6.34-6.94
	Dallas		6.25-6.85
WR4ACX	Eatonton		6.10-6.70
WB4CNC	Griffin		6.31-6.91
WR4ABD	Mableton		6.13-6.73
K4SEX	Newnan		6.19-6.79
WR4ADH	Rome	W2.1	6.34-6.94
W4RRW	Smyrna		6.28-6.88

HAWAII

KH6EON	Hilo		6.22-6.82
KH6EQF	Honolulu		6.28-6.88
			52.525-53.520
			449.15-444.15
KH6EQR	Lualualei		6.16-6.94
KH6EQK	Mt. Holeakala		6.34-6.94
KH6EQL	Waialva		6.16-6.76
KH6FOX	Waikiki		6.16-6.76
KH6NLH	Waipahu		6.16-6.76

IDAHO

WR7ABA	Boise		6.28-6.88
K7ZZL	Deer Point		6.34-6.94
WR7ABX	Moscow Mountain		6.22-6.82

ILLINOIS

W9WWD	Alton		6.04-6.48
WA9EAW	Aurora		CLOSED
WA9WVA	Batavia		CLOSED
WA9GCK	Bloomington		6.22-6.82
WR9AGU	Carbondale		6.13-6.73
WB9AEK	Chicago		6.01-6.61
			445.35-449.35
			445.40-449.45
WA9DZO	Chicago PL		6.10-6.85
WA9EAP	Chicago		7.45-7.75
W9NGI	Chicago		7.45-7.75
WR9AAF	Chicago		6.34-6.94
WR9ABB	Chicago		448.60-443.60
			223.34-224.94
WR8ABY	Chicago		6.16-6.78
			448.75-443.75
W9MJL	Danville		6.28-6.88
WA9WJG	Danville		6.04-6.64
K9HGX	Decatur	T2.2	6.34-6.94
WA9TEC	Decatur	W2.2	6.34 449.60
WR9ABD	Elgin		6.10-6.79
WB6ADW	Genoa		6.13-6.76
W9BYZ	Genoa	T1.65	6.16-6.76
		T1.65	6.34-6.94
WB9HWS	Hinsdale	T2.5	6.22-6.70
WR9AAA	Joliet		6.28-6.987
WR9AAD	Murphysboro		6.25-6.85
WB9AEU	Oak Lawn		442.30-447.30
WR9ACK	Oak Lawn		6.28-6.88
WB9AEF	Peoria		6.14-6.76
WA9EAM	Petersburg		6.34-6.94
WB9AOI	Quincy		6.34-6.94
K9CLW	Rockford		6.22-7.30
WB9EEH	Rockford		6.00-6.88
W9FBS	Rockford		6.22-7.30
W9DGV	Rock Island	T1.8	6.34-6.76
WR9ABX	Rock Island		6.34-6.94
W9AIU	St. Louis		6.16-6.76
WB9IEZ	Skokie PL		CLOSED
W9YIY	Troy		6.16-6.76
WA9WVB	Urbana	T1.8	6.34-6.76
WA9LIV	Waukegan	T1.95	5.95-6.55
WR9ABH	Western Springs		6.07-6.67
			223.30-224.00
K9CLW	Winnebago		CLOSED

INDIANA

WR9ALI	Anderson		6.22-6.82
			6.34-6.78
K9KTH	Bloomington		6.22-6.82
WR9ABR	Columbus		6.19-6.79
WR9ABI	Elkhart		6.04-6.64
WA9ZFM	Evansville	W	52.920-52.575
WB9FHD	Freemont		52.640-52.525
WA9EAU	Ft. Wayne		6.16-6.76
WR9AAC	Ft. Wayne		6.34-6.94
WR9ABN	Ft. Wayne		6.28-6.88
WR9ACJ	Ft. Wayne		
WB9RAI	Indianapolis		6.16-6.76
WR9ABA	Indianapolis		6.10-6.70
WR9ABP	Indianapolis		6.16-6.76
WR9ABW	Kokomo		6.31-6.91
W9EJV	Lafayette		6.16-6.76
K9JSI	La Porte		6.22-6.82
W9CSF	Michigan County	T1.8	6.37-6.97
WR9ABD	Pittsburg		6.13-6.73
WR9ACG	Plymouth		6.07-6.67
WB9ADD	Schereville		6.31-6.91
W9EHZ	Schereville		6.34-6.91
W9EQD	Terre Haute		52.920-52.525
WA9UHY	Wabash		7.63-7.03
WR9ABL	Warsaw		6.25-6.85

IOWA

WRØACR	Ayrshire		6.22-6.82
WAØVVA	Cedar Rapids	T2.0	6.16-6.76
WAØABY	Clarinda		6.37-6.97
WABVVD	Council Bluffs		6.22-6.82
WRØABS	Davenport		6.22-6.82
KØIXR	Des Moines	W	6.34-6.94
WR8ABD	Dubuque		6.34-6.94
WR8ACU	Iowa City		6.28-6.88
WAØBBD	Ottumwa		6.34-6.94
WAØVVQ	Ottumwa		6.04-6.64
WABSNS	Waterloo		6.34-6.94

KANSAS

WAØABU	Kansas City		6.22-6.82
WAØAMR	Kansas City		6.34-6.94
			52.700-52.625
K8DKI	Kansas City		52.800-52.626
WRØACH	Lawrence		6.16-6.76
WAØVWN	Lawrence		6.28-6.88
WR8ABV	Lenera		52.880-52.525
WRØABW	Merriam		448.10-449.10
WAØVVW	Pittsburg		6.34-6.94
WRØABO	Pittsburg		6.13-6.73
WAØVWR	Plainsville		6.28-6.88
WABCJG	Salina		6.34-6.94
WRØACG	Topeka		6.34-6.94
WRØABB	Wichita		6.22-6.82
WRØABK	Wichita		6.34-6.94
WRØABZ	Winfield		6.16-6.76

KENTUCKY

WR4ACD	Ashland		6.34-6.94
W4YWH	Covington		6.13-6.73
			6.19-6.79
WB4VQF	Lexington		6.34-6.76
WR4ACR	Lexington		6.16-6.78
W4MDP	Louisville		6.34-6.94
WB4RYX	Louisville		6.28-6.88
WR4ABD	Murray		6.34-6.94
WR4ACD	Owensboro		6.34-6.94

LOUISIANA

WA5MZZ	Alexandria		6.34-6.94
WA5ZHD	Baton Rouge		6.34-6.94
W5WN	Lake Charles		6.34-6.94
WB5CDP	Monroe		52.827-52.525
W5MLE	Morgan City		6.34-6.94
WB5AEG	New Orleans		444.20-449.20
W5UK	New Orleans	T1.8	6.34-6.94
K5JRV	Shreveport		6.22-6.82
W5ZS	Shreveport		6.31-6.91

MAINE

WR1ACI	Bangor		6.34-6.94
WA1KGZ	Buckfield		6.26-6.88
WA1KGP	Sanford		6.13-6.73

MARYLAND

W3EHT	Baltimore		6.19-6.79
K3MDX	Baltimore		6.91-7.33
			6.91-7.22
WR3ABG	Baltimore		6.07-6.67
WR3ABC	Cheverly		6.01-6.61
W3IJF	Frederick		6.13-6.73
WA3EWJ	Gaithersburg		6.04-6.64
WR3ABB	Greenbelt		6.28-6.88
WA3DZD	Hermans		6.16-6.76
WR3ABD	Harmans PL		443.95-448.95
WA3PPN	Havre de Grace		6.25-6.85
WA3CJD	Hyattsville		52.760-52.525
WA3ENJ	Montgomery		443.00-442.45
K3SVA	Salisbury		6.22-6.82
WA3PJQ	Severn		6.46-7.06
W3JCN	Silver Spring		448.00-449.00
W3ZM	Silver Spring		6.25-6.85
W3FT	Wheaton		6.07-6.67
			448.30-449.30
			223.30-224.39
			6.40-7.00

MASSACHUSETTS

WA1HDS	Agawam		7.66-7.06
WR1ACB	Bellingham		7.72-7.12
WR1ABP	Billerica		6.07-6.67
WR1AAI	Boston		6.39-6.09
W1UD	Brookline		6.43-7.42
WA1DXW	Fall River		6.19-6.79
WR1ABI	Fall River		52.010-52.700
			7.75-7.15
WR1ABB	Framinghem		6.34-6.94
WR1ABX	Holyoke (Mt. Tom)		52.780-52.525
			6.31-6.91
WR1AAA	Malden		6.19-6.79
WR1ACD	Malden		7.87-7.03
W1QFO	Marlboro		6.01-6.61
WR1AAH	Marlhoro		7.84-7.24
WR1ABY	Maynard		7.81-7.21
DL2AA/WR1	Medway		6.31-6.91
K1FFK	Mt. Greylock		52.780-52.525
WA1KHC	Mt. Lincoln		6.13-6.73
WR1ACH	Newton		7.96-7.36
WA1KFZ	No. Adams		6.43-7.42
WR1AAC	Salem		6.28-6.88
WA1MHN	Somerville		6.145-7.45
W1ACM	Stoughton		6.775-6.175
WR1ABN	Walpole		7.69-7.09
WR1ABV	Waltham		6.04-6.64
WR1ABG	Webster		6.28-6.88
W1MTV	Westfield		6.10-6.70
WR1ABJ	Weston		6.22-6.82
WR1ABO	Worcester		6.37-6.97

MICHIGAN

WB8CSC	Ann Arbor		6.37-6.97
WB6CRH	Bangor		52.640-52.525
WB8CSA	Benton Harbor	T2.4	6.34-6.94
WB8MAI	Benton Harbor		6.22-6.82
WA8BDD	Clarkston		6.25-6.85
WB8CRK	Detroit		449.00-444.00
WB8COS	Detroit PL		6.16-6.76
WR8ACF	Detroit PL		6.04-6.64
WB8CRW	East Tawas		6.34-6.94
W8IIE	Grand Rapids	T2.15 or PL 100	6.16-6.76
WA8PUD	Grand Rapids	T2.4	6.34-6.94
WB8CSU	Jackson		6.13-6.73
WR8ABZ	Jackson		6.28-6.88
WB8COM	Lansing		6.34-6.94
WB8CRD	Manistee		6.16-6.79
WR8AAA	Milford		6.19-6.79
			7.79-6.79
	Monroe		6.13-6.73
K8WNJ	Muskegon	T2.25	6.22-6.82
WR8ABI	Oshtemo		6.19-6.79
WB8CRN	Trenton		443.70-432.90
K8TJP	Trenton		433.70-432.90
			437.90-432.90
K8WKE	Utica		6.28-6.91
WB8HEE	Whitmore Lake		6.13-6.73

MINNESOTA

K2DPT/Ø	Albert Lea		6.34-6.94
WØGUP	Duluth		6.34-6.94
KØRTU	Elk River		6.37-6.97
WAØSSN	Faribault		6.16-6.76
WAØJCX	Minneapolis-St. Paul		6.28-6.88
KØLAV	Minneapolis-St. Paul		6.25-6.85
WAØNPZ	Minneapolis-St. Paul		6.94-6.46
KØPML	Minneapolis-St. Paul	T1.8	6.16-6.76
W8PZT	Minneapolis-St. Paul		6.22-6.82
WA8DDF	Rochester		6.34-6.94
KØPMU	St. Paul	T1.8	6.16-6.76
WØUGR	Waseca	T1.65	6.34-6.94
			6.94-6.46
WØWUG	Wilmar		6.34-6.94

MISSISSIPPI

K6TYP	Biloxi	T2	6.34-6.94
WA6RMS	Gautier	T2.4	6.34-6.94
WR5ABT	Jackson		6.28-6.88
WR6ACC	Jackson		6.16-6.76

MISSOURI

WRØABP	Barry		CLOSED
WRØABC	Bonne Terre		6.28-6.88
WAØVWP	Columbia		6.16-6.76
WABZIK	Eldon		6.28-6.88
WRØACT	Independence		7.69-7.09
WAØAMR	Kansas City		6.16-6.76
KØFRA	Kansas City		52.700-52.525
KØDKI	Kansas City		448.10-449.10
WAØTEG	Kansas City		52.880-52.525
WAØVVB	Kansas City		6.34-6.94
WRØABP	Kansas City		CLOSED

WA8CJW	St. Louis		6.34-6.94
K8RWU	St. Louis		52.050-51.250
WR8A8H	St. Louis		6.28-6.88
WR6A6I	Savannah		6.25 6.85
			6.18-6.85
WA8VVV	Springfield		6.31-6.91

MONTANA

W7YB	Bozeman		6.34-6.94
WA7KZF	Butte-Anaconda		6.34-6.94
			448.15 449.15
WA7QAA	Great Falls		6.34-6.94
	Sweetgrass		6.34-6.94

NEBRASKA

WR8ACO	Beaver Crossing		6.18-6.76
WR8ABA	Bellevue		6.04-7.30
WA8MFC	Lincoln		6.18-6.76
K8VRL	Lincoln		.8 34 6.94
WR8A8Q	Omaha		6 34-6.94

NEVADA

W7AKE	Las Vegas		7.18-7.84
WA7HXO	Las Vegas		6.34-6.94
			6.40-6.94
WA7LAH	Reno		6.34-6.94
WA7NHV	Reno		6.34-6.94
			7.00-6.94
K7UQT	Reno		6.94-7.48
K7VJZ	Reno		6.94-6.525

NEW HAMPSHIRE

WR1ABU	Concord		6.34-6.94
WR1ABQ	Derry		6.25 6.85
WR1ACN	Londonderry		7.66-7.08
WA1KFV	Manchester		5.885-7.33
WR1ABF	Salem PL		6.37-6.97
WR1ACL	Salem		7.765-7.165

NEW JERSEY

WR2ABJ	Cedar Grave		7.18-7.78
K2TYV/2	Denville		6.385-6.395
K2DDP	Fords		447.40-449.40
WA2UWO	Fords PL		6.22-6.82
WA2UWC	Greenbrook		6.34-6.94
W2QW	Martinsville		6.925-6.625
WR2ACO	Northfield (near Atlantic City)		6.16-6.78
WR2ABN	Oakland		6.10-6.70
WA2UWR	Paramus PL		6.19-6.79
K2GE	Sayreville		6.16-6.76
WB2ZWO	South Jersey		6.22-6.82
WR2ABR	Toms River		6.31-6.91
K2GCL	Waldwick PL		8.25-6.85
WA2PRO	W. Orange		443.25 448.26
WR2ABM	Woodbridge		6.22-6.82

NEW MEXICO

K5CQH	Albuquerque		8.34-6.94
WA6OIP	Albuquerque		8.25-6.85
WA5QLZ	Albuquerque		6.28-6.88
WA6QXB	Albuquerque		6.40-7.00
WA5YUG	Albuquerque		53.725-52.525
WA5KUI	Alamagordo		6.34-6.94
WR5ABQ	Las Cruces		6.16-6.76
W5POO	Los Alamos		6.34-6.94
WA5JOZ	Mt. Taylor		6.34-6.94
WA6YTO	Portales		6.34-6.94
WA5OMQ	Roswell	T2.4	6.34-6.94
K5SFB	Sandia Crest		448.60-443.60
WA5VKY	Sandia Crest		6.46-7.06
WA5YTK	Sierra Blanca		5.58-6.50

NEW YORK

WR2ABQ	Babylon L. I.	TT	7.63-7.83
W2ARI	Bath		6.34-6.94
WR2ABB	Beacon		6.37-6.97
WR2ABP	Bedford		7.705-7.105
WA2POJ	Bellmore		6.25-6.85
WR2ABS	Binghampton		6.22-6.82
WA2CKW	Birch Hill		5.20-7.12
K2LOT	Boston		6.31-6.91
WR2ACV	Brooklyn		7.43-6.43
WR2ABU	Buffalo		6.31-6.91
WA2UYO	Cherry Creek		6.31-6.91
WR2ACA	Cherry Creek		6.48-7.00
WA2ZWM	Cobleskill		6.01-6.81
W2SB	Dunkirk		6.28-6.85
WA2UVX	Dutchess Co.		7.09-7.69
WR2AGL	Elmira		6.10-6.78
WA2UYI	Farmingdale L. I.		441.78-446.75
W2AWX	Fishkill		441.18-449.18
W2AWG	Flushing L. I.		443.75 448.75
WR2ACD	Flushing L. I.		6.16-6.76
	Flushing L. I.		7.08-6.89
WR2ACF	Fredonia		7.87-7.87
WR2ACM	Fredonia		6.25-6.85
WR2ACK	Gloversville		8.18-6.78
K2KOA	Hempstead		441.78-848.78
WR2ACE	Hicksville L. I.		7.736-7.135
WA2UZE	Huntington L. I.		7.93-7.33
WR2ABT	Huntington L. I.		7.93-7.33
WA2UWK	Jamestown		6.28-6.88
WR2ABW	Larchmont		6.31-6.91
K2UHO	Long Island		7.12-7.69
W2WJS	Long Island		441.65 446.65
WR2ACB	Long Island		6.16-6.76
WB2AEB	Mahopac		CLOSED
WA2ZDX	Manhattan		7.84-7.24
WA2ZWN	Manhattan		7.15 7.75
WR2AAA	Manhattan		6.13-6.73
WR2AAC	Manhattan		7.84 7.24
WR2ACO	Manhattan		6.40 7.00
WR2ACV	Manhattan		7.43-6.43
WA2SXX	Millbrook		7.09-7.89
			7.73-6.73
W2CVI	Mt. Beacon		441.15-446.18
WA2UYP	Mt. Beacon		441.15-446.15
WR2ABB	Mt. Beacon		5.37-6.97
WA2MVT	Plattsburgh		6.22-6.82
WR2ABE	Port Chester		5.34-6.94
WA2UWD	Rochester		6.28-6.88
WR2ABF	Rochester		6.19-6.79
WR2ACJ	Rochester		6.28 6.88
W2IBW	Rockland Co.		CLOSED
WR2ACC	Rockville Centre		6.07-6.67
WR2ABO	Rome		8.28-6.88
WR2ABV	Schenectady		6.46-6.94
WB2GDF	Staten Island		449.25 444.25
WA2YYD	Staten Island		6.28-6.94
WA2YZZ	Staten Island		449.25 444.25
WR2ABK	Staten Island		7.915-7.315
WR2ACB	Stonybrook L. I.		8.18-6.76
WA2IWZ	Syracuse		6.04-6.64
WA2UWF	Syracuse		6.22-6.82
WA2ZYZ	Syracuse		6.31-6.91
WR2ABG	Syracuse		6.46-7.06
WR2ABD	Tompkins Co. (near Ithaca)		6.37-6.97
WR2ABZ	Troy		6.22-6.82
WR2ACL	Troy		7.69-7.09
K2GVI	Utica-Rome		6.34-6.94
			444.20 449.20
WR2ADA	Utica		5.15-6.76
WR2ACI	Valhalla		7.66-7.06
K2LJC	Woodmere		6.04-6.64
WB2SED/2	Yonkers		221.74-224.74
WR2AAB	Yonkers		6.31-6.91

NORTH CAROLINA

WA4NUO	Asheville		6.22-6.82
WR4ABQ	Aurora		6.34-6.94
WR4ADS	Baulaville		6.34-6.94
WA4FYS	Burlington		52.760-52.525
	Burlington		6.19-6.79
WB4QFZ	Chapel Hill		6.22-6.82
K4RSH	Chapel Hill		6.22-6.82
WR4ABK	Charlotte		6.46-7.06
WR4ABT	Charlotte		8.28-6.88
WR4AEI	Charlotte		CLOSED
WR4AEU	Charlotte	T1.8	6.34-6.94
WB4OFT	Durham		6.22-6.82
			444.25 449.10
K4RUQ	Durham	W	6.34-6.94
WR4ADN	Elizabeth City		6.28-6.88
WR4ADK	Fayetteville		6.31-6.91
			50.480 53.450
WB4KIB	Gastonia		6.37-6.97
W4NBR	Goldsboro/Kinston		6.16-6.76
WR4ABL	Greensboro		8.16-6.76
WR4ABP	Grifton		6.16-6.76
WR4ABY	Hendersonville		6.04-6.94
WR4AOT	High Point		6.40-7.00
	High Point		6.19-6.79
W4WIO	Lenoir		52.768-52.525
WR4ACM	Lenoir		6.25 6.85
WR4ABX	Lexington		6.31-6.91
WB4NXE	McCain		52.780 52.525
WR4ACJ	Mt. Airy		6.37-6.97
WR4AEV	Mt. Pisgah		6.18-6.78
			222.34-223.94
WR4AFB	Murfreesboro		6.31-6.91
WA4EHL	Raleigh		52.788-52.525
K4ITL	Raleigh		6.28-6.88
WR4ACF	Raleigh		6.04-6.64
WR4ADE	Reidsville		6.25-6.85
WB4PPS	Roaring Gap		6.22-6.82
WR4AAA	Salisbury		6.13-6.73
WR4AEF	Seven Springs		6.25-6.88
WR4ABF	Shelby		8 28-6.88
	Spindale		6.07-6.67
W4OCD	Wilkesboro (No.)		52.788-52.525
WA4ZAT	Wilmington		6.22-6.82
WR4ACA	Winston-Salem		6.84-6.94

(No repeaters currently listed in North Dakota.)

OHIO

	Akron		6.04-6.64
K8HRS	Ashtabula		8.16-6.76
K8TQK	Athens		6.38-6.94
	Cambridge		6.25-6.85
WA8VWH	Canfield		8.28-6.88
WR8ABT	Cheviot		6.07-6.67
WR8ABO	Chillicothe		6.25 8.85
WB8COS	Cincinnati		6.18-6.76
WB8NON	Cincinnati		6.115-6.70
W8OIO	Cincinnati	T1.9	52.920-53.050
K8SCH	Cincinnati		6.07-6.67
WR8ABP	Cincinnati		6.28-6.88
	Cincinnati		7.78-7.18
	Cincinnati		7.99-7.39
WB5CRV	Cleveland		6.26-6.88
			6.40 6.88
W8TTD	Cleveland		6.22-6.82
WR8ABC	Cleveland		8.16-6.76
WR8ABD	Cleveland		6.34-6.94
	Cleveland		6.25-6.85
W8AIC	Columbus		6.16-6.76
			6.34-6.78
W8WTB	Columbus		6.18-6.76
	Columbus		6.31-6.81
	Columbus		7.88-7.66
	Columbus		7.81-7.21
WB8CQK	Dayton		6.84-6.84
			6.16-6.76
WR8ABF	Dayton		6.34-6.94
	Dayton		6.22-6.82
WR8ABK	Delaware		6.37-6.87
K8ZES	Galion		6.25-6.85
WA8WMH	Hamilton		6.37-6.97
WR8ABH	Hudson		6.61-6.81
W8HH	Marietta		6.26-6.68
K8PWL	Miamisburg		8.22-6.88
WR8ABE	Miamisburg		6.22-6.82
WB8ATD	Monroe		6.81-6.81
WR8ABA	Mt. Vernon		6.19-6.78
	Newark		6.28-6.88
WR8ABJ	Newcomerstown		6.13-6.73
K8JHG	Ottawa	W1.8	6.28 6.88
			52.768-52.525
			53.360-53.540
			52.766-53.646
WR8ABG	Springfield		6.13-6.73
K8ZPR	Steubenville		6.34-6.76
K8ALB	Toledo		6.01-6.61
WB8COD	Toledo		6.20-6.80
			6.34-6.94
	Toledo		6.18-6.79
	Troy		6.46-6.68
WB8CRU	Tuscarawas		6.34-6.76
W8IOO	Youngstown		6.31-6.76
			6.34-6.76
WR8ACL	Youngstown		6.31-6.91

OKLAHOMA

WA5YUF	Ardmore		6.34-6.94
			6.46-6.94
WA5LOJ	Bartlesville		6.34-8.84
	Cherokee		6.94-5.98
WA5MOA	Chickasha		6.34-6.94
			6.37-6.87
WA5YUH	Durant		6.34 6.94
WR5ABW	Enid		8.34-6.84
K5CFM	Oklahoma City		6.22-6.82
WA6YTI	Oklahoma City		6.34-6.94
WA5ZZA	Oklahoma City		5 16-6.76
	Ponca City		6.34-8.94
WA5LVT	Tulsa		6.34-6.94
			6.28-6.88
			52.880-52.525
WA5SJE	Tulsa		6.22-6.82

OREGON

W7DBS	Eugene	T1.8	6.34-6.94
K7KGV	Grants Pass		6.34-6.94
	King Mountain		6.34 8.94
	La Grand		6.24-6.76
W7FIO	Lookout Mountain		6.34-6.94
			52.928-53 468
	Mary's Peak	T2.25	6.34-6.94
W7OFY	Medford		6.34-6.94
W7OXX	Mt. Scott		6.34 8.94
	Newport		8.76-6.94
	Pendleton		8.34-6.78
K7OVK	Portland		447.17 449.17
W7VS	Portland		6.34-8.96
WR7ABE	Portland		444.17 449.17
WR7ABJ	Westport		6.18-6.79

PENNSYLVANIA

W3OI	Allentown		6.34 6.94
K3ZFO	Bensalem		6.37-6.97
WA3IGS	Berwyn		6.28-6.79
			62.888-82.726
W3VV	Bradford		6.28-6.85
			6.34-6.94
WR3ABZ	Center Point		7.88-7.98
WR3ACD	Churchville		222.98-284.58
K3ZTP	Coatesville		6.22-6.62
K3DSM	Devon		448.08-840.00
WA3KXO	Erie		6.19-6.94
			6.34-6.94
WR3ABY	Erie	W1.477	6.22-8.82

WR3ACA	Erie		6.34-6.94
			6.19-6.94
WA3KXG	Ettert		6.16-6.76
WR3AAA	Freedom		6.28-6.88
WA3KXE	Harrisburg		448.00-440.00
			444.95-449.95
WA3KFX	Hellin		6.01-6.61
K3GKB	Honeybrook		6.13-6.73
W3OK	Lehigh Valley		6.10-6.70
WR3ABN	Meadville		6.34-6.94
WA3RFL	Mt. Holly Springs		6.28-6.88
WR3ACE	New Holland		6.01-6.61
			223.34-224.94
K3AWZ	Philadelphia		6.28-6.88
WA3BKO	Philadelphia		6.13-6.73
			6.16-6.76
			6.19-6.79
			6.25-6.85
			6.28-6.88
			6.31-6.91
			6.34-6.94
			6.37-6.97
			5.40-6.97
WA3KUR	Philadelphia		6.31-6.91
			52.720-52.640
			448.80-443.80
WA3KVR	Philadelphia		52.720-443.80
WA3KWI	Philadelphia		6.37-6.97
WA3KWL	Philadelphia		449.00-444.00
W3OV	Philadelphia		29.640-29.493
W3SK	Philadelphia		6.37-6.97
WR3ACH	Pittsburgh		6.22-6.82
WA4BJS	Pittsburgh		6.16-6.76
WA3GNO	Pittsburgh		6.37-6.97
WA3QCE	Pittsburgh		6.28-6.68
W3BN	Reading		52.575-52.680
W3CCH	Reading		52.575-52.640
WR3ABO	Richhere		6.18-6.79
	Scranton		6.34-6.94
WA3IPP	Sellersville		6.28-6.78
			446.50-449.50
WA3KUW	State College		6.34-6.76
WR3AGH	Valley Furge		222.34-223.94
WR3ABI	Valley Forge		6.34-6.94
WA3MQP	Warminster		446.55-443.55
K3PSP	Washington		6.19-6.79

RHODE ISLAND

WR1AAG	Cranston		6.10-6.70
WR1ACG	Johnston		222.38-223.98
WR1ACE	Lincoln		6.16-6.76
WA1OMS			

SOUTH CAROLINA

WR4ABB	Augusta (No.)		6.13-6.73
WR4ADG	Caesar's Head		6.01-6.61
WA4MPC	Columbia		6.28-5.88
WR4ABA	Columbia		6.28-6.88
WR4ACD	Columbia	T1.8	6.34-6.94
			52.760-52.525
WB4QGK	Charleston	T1.4	6.34-6.94
	Florence		6.37-6.97
WB4PUP	Greenville		6.34-6.94
WR4ABG	Greenville	T2.4	6.34-6.94
WA4SSJ	Greenville		52.760-52.525
WR4ABM	Lancaster		6.10-6.70
	Pickens		6.40-7.00
	Rock Hill		6.25-6.85

SOUTH DAKOTA

WB0GS	Aberdeen		6.34-6.94
WB0BXO	Brookings	W1.8	6.34-6.94
K0RTD	Pierre		6.34-6.94
WA0CPX	Rapid City		6.34-6.95
WA0VWH	Rapid City		6.34-6.94
WR0ABX	Sioux Falls	T1.8	6.34-6.94
WH0ACK	Sioux Falls		6.16-6.76

TENNESSEE

WR4ADA	Chattanooga		6.19-6.79
WB4QEY	Gallatin	T	6.04-6.64
			6.84-7.16
WR4ADO	Kingsport		6.18-6.76
W4SKH	Knoxville		6.28-6.86
W4TEA	Knoxville		6.18-6.78
WR4AOF	Knoxville		6.34-6.94
			52.760-52.525
			449.30-444.30
K4RSV	Lenoir City		6.16-6.76
WR4ACI	Manchester		6.18-6.70
K4BN	Memphis		6.34-6.94
W4BS	Memphis		6.16-6.76
			6.22-6.76
			444.00-449.00
WA4HBY	Memphis		6.18-6.82
WA4BXI	Nashville (remote)	T2.805	6.04-6.64
WB4EKI	Nashville PL		6.40-7.00
W4RFR	Nashville		6.34-6.94
WA4TOA	Nashville		6.04-6.64
WA4YND	Nashville		6.70-7.70
WR4AGV	Nashville PL		6.25-6.85
			5.75-449.65
WR4ACS	Nashville PL		6.16-6.76
WR4ACT	Nashville		52.928-52.525
WR4ACU	Nashville		443.45-448.45
WR4ACY	Nashville	T2.805	6.28-6.88
W4IWV	Shelbyville		6.34-6.94
K4EGC	Tullahoma		6.10-6.70
	Walland		6.34-6.94
W4WLH	Winchester		6.22-6.82

TEXAS

	Abilene		6.34-6.94
	Alice		444.10-449.10
WA5GRC	Amarillo		6.34-6.94
			444.50-449.50
WA5YTO	Austin		6.34-6.94
WA6YZD	Austin		449.10-444.10
W5AW	Big Spring		6.22-6.82
WR5ABM	Brownfield		6.22-6.82
WA5YTJ	Corpus Christi		6.34-6.94
WA5HNW	Dallas-Ft. Worth		53.550-52.750
WA5VKW	Dallas		6.28-6.88
WR5ABA	Dallas		6.01-6.61
WR5ABD	Dallas		6.22-6.82
W5HHS	Denton		6.25-6.85
K5WPH	El Paso		6.28-6.88
WA5MWI	Ft. Smith		6.34-6.94
K5OSV	Ft. Worth		53.325-53.725
WA5KTO	Ft. Worth		6.16-6.76
WA5YTM	Ft. Worth		6.34-6.94
	Ft. Worth		53.650-53.150
WA5OTZ	Houston		6.22-6.82
WR5AAA	Houston		6.28-6.88
WR5ABP	Houston		6.01-6.61
WR5ABO	Houston		444.20-449.20
WA5YTY	Killeen		6.34-6.94
WB5EMR	Levelland		6.28-6.88
WA5YUP	Longview		6.26-6.86
WB5BRY	Lubbock		6.34-6.94
WR5ACF	Lufkin		6.34-6.94
W5YNI	Mainview		6.22-6.82
WR5AON	Midland		6.16-6.76
	Mt. Franklin		6.28-6.88
WA5SNJ	Pasadena		6.34-6.94
W5YNL	Plainview		6.22-6.82
			6.22-6.94
WA5YUS	Port Arthur		6.34-6.94
WA5YUB	Richmond		6.16-6.76
W5UFO	San Angelo		6.34-6.94
WA5UNH	San Antonio		52.680-52.525
WA5VKZ	San Antonio		6.34-6.94
WR5ABZ	San Antonio		7.30-7.18
WR5ABB	Sequin		6.34-6.94
WA5LDL	Tyler		6.34-6.94
WR5ABC	Victoria		6.16-6.76

UTAH

WR7AAA	Cedar City		6.34-6.94
WA7AKI	Salt Lake City		6.34-6.94
			444.90-449.90

VERMONT

WH1ACA	Mt. Ascutney		6.16-6.76
W1ABI	Mt. Killington		6.26-6.88
			441.20-446.20
W1KOO	Mt. Mansfield		6.34-6.94
			444.40-449.40

VIRGINIA

WB4QFP	Arlington		6.31-6.91
WB4URR	Blue Mountain		6.37-6.97
WB4KNX	Charlottesville		6.24-6.88
K4QQS	Chesapeake		6.22-6.78
WB4QEP	Danville		6.26-6.88
	Danville		6.10-6.70
WR4ADY	Forrest		6.34-6.94
WB4XNU	Hampton		6.34-6.94
WR4ACN	Hampton		6.18-6.79
WR4ABU	Lexington		6.01-6.61
W4GCE	Lynchburg		6.22-7.42
WB4HCX	Lynchburg		6.34-6.94
WR4AEN	Lynchburg		6.18-6.76
WB4KBN	Newport News		6.34-6.94
K4QQB	Norfolk		6.22-6.78
WA4ZAU	Norfolk		6.16-6.76
W4DXC	Richmond		52.720-52.640
W4NJE	Richmond		6.22-7.42
WB4QEO	Richmond	W1.4	6.34-6.94
WR4ACW	Richmond		6.28-6.88
WR4AOI	Richmond	T1.336	6.34-6.94
WB4OET	Roanoke		6.34-6.94
WB4OFS	Roanoke		6.38-6.80
	Roanoke		6.28-6.88
WB4OFF	Tyson's Corner		6.31-6.91
WA4NOT	Virginia Beach		6.37-6.97

WASHINGTON

WA7KZG	Bawfaw Mountain	T1.95	6.34-6.94
WR7ACB	Chehalis	T1.95	6.34-6.94
	Eohrata		6.34-6.94
WR7ACR	Everett		6.31-6.91
W7OAQ	Longview		53.290-6.76
WR7ACF	Mica Peak		6.28-6.88
			449.85-444.85
	Moses Lake		6.34-6.94
K7OKL	Mt. Rainier		6.34-6.94
WR7ACE	Mt. Spokane		6.34-6.94
K7IUT	Olympic		52.525-53.290
W7FHZ	Puget Sound		CLOSED
K7PBU	Puget Sound		449.85-444.85
W7OXX	Rattlesnake Mountain		6.34-6.94
WR7ABC	Renton		6.22-6.82
K7TGH	Richland		52.525-53.290
W7OBF	Seattle		CLOSED
K7GMR	Seattle		52.525-53.290
W7PUG	Seattle		CLOSED
WR7ACJ	Seattle		6.37-6.97
K7LBV	Spokane		52.525-53.290
K7PYC	Tumwater		52.525-53.290
WA7AJF	Vancouver		53.290-53.460
	Wenatchee		53.290-53.460
WR7ABZ	Yakima		6.34-6.94

WEST VIRGINIA

WR8ACD	Charleston		6.28-6.88
WR8ABG	Fairmont		6.28-6.88
WB8ARY	Huntington		6.34-6.76
K8SXO	Huntington		6.34-6.76
WA8ART	New Martinsville		6.34-6.94
WR8ACJ	Parkersburg		6.37-6.96
K6ZPR	Weirton		6.34-6.76
W8JOJ	Wheeling		6.34-6.76

WISCONSIN

WA9ZEF	Appleton		6.28-6.88
WR9ABE	Baraboo		6.28-6.88
WR9AAE	Cedarburg	T2.25	6.37-6.97
W9AYR	Green Bay		6.28-6.88
WR9ABV	Lake Geneva		6.37-6.97
WA9WVE	Madison	T2	6.46-6.68
WR9ABT	Madison	T2.1	6.16-6.76
WB9AES	Maukeshe PL		6.22-6.82
WB9ADK	Milwaukee		6.16-6.76
WB9ADX	Milwaukee		6.31-6.91
W9WK	Milwaukee		6.07-6.67
WR9ABF	Milwaukee		7.99-7.39
			52.800-52.525
			449.50-444.50
			1250.0-1220.0
WR9ABS	Milwaukee		6.25-6.85
	Milwaukee		448.75-443.75
K9YFF	Racine		52.600-52.525
W9AIO	Sturgeon Bay		6.16-6.76
WA9LIV	Waukegan		5.95-5.55

WYOMING

K7KMT	Casper		6.34-6.94
WA7KZC	Cheyenne		6.18-6.76
			446.30-449.30
WA7EGK	Laramie		6.34-6.94
			6.76-6.94
W7RPV	Thermopolis		6.16-6.76

CANADA

ALBERTA

VE6QE	Alberta		6.46-7.00
VE6AUY	Calgary		6.46-7.00
VE6WO	Edmonton		6.46-7.33
VE6WQ	Edmonton		6.46-7.00
VE6OL	Grand Prairie		6.46-7.00
VE6CAM	Lethbridge		6.28-6.88
	Lethbridge		6.34-6.94

BRITISH COLUMBIA

VE7ELK	Chilliwick		6.46-7.00
	Kamloops		6.34-6.94
VE7CAP	Kimberly		6.34-6.94
VE7GTU	Nelson		6.46-7.33
	Penticton		6.34-6.94
VE7AFG	Prince George		6.56-7.33
VE7CAQ	Trail		6.34-6.94
VE7RPT	Vancouver		6.34-6.94
VE7VAN	Vancouver		7.72-7.12
	Vancouver		6.40-7.00
VE7BEL	Victoria		6.22-7.64

MANITOBA

VE4BON	Brandon		6.46-6.94
VE4XK	Winnipeg		6.46-6.94

NEW BRUNSWICK

VE1GT	Fredricton		6.34-6.94
VE1PO	Fredricton		6.18-6.76
			(AM) 7.60-4.225

VE1RPT	Moncton		6.28-6.88
		TT	62.8-52.525
		TT	52.525-7.52
VE1KI	St. John		6.22-8.82

NEWFOUNDLAND

VO1KI	Cornerbrook		6.46-6.94
VC1AV	Grand Falls		6.46-6.94
VO1GT	St. Johns		6.46-6.94

NOVA SCOTIA

VE1ATN	Charlottetown		6.10-51.515
	(Prince Edward Island)		52.525-7.00
VE1HI	Charlottetown		6.34-6.94
	(Prince Edward Island)		
VE1HR	Fraser's Mountain		6.16-6.76
	(New Glasgow)		
VE1ARC	Halifax		6.34-6.94
VE1AEH	Mt. Blomidon		6.58-7.18
VE1JO	Sydney		6.46-6.94
VE1XK	Truro		6.46-6.94
			6.46-7.06

ONTARIO

VE3K8R	Belleville		6.46-6.94
VE3MRT	Bracebridge		6.28-6.88
VE3TCR	Brantford		6.55-7.15
VE3KCR	Chatham		6.34-6.94
			7.46-7.06
VE3GDD	Goderich		6.46-5.6
			6.43-5.03
VE3LCR	Grimsby		6.49-7.09
VE3URW	Hamilton		6.16-6.79
VE3BSD	Kingston		6.46-6.94
VE3KER	Kingston		6.34-7.06
VE3KSR	Kitchener		6.34-6.94
			6.37-6.97
VE3LAC	London		6.46-7.06
VE3NFM	North Bay		6.34-6.94
VE3OSH	Oshawa		6.40-7.12
VE3PBO	Peterborough		6.34-6.94
VE3BER	Port Colbnrne		449.40-449.70
	(FAX-RTTY)		
VE3WCR	Port Colborne		6.43-7.30
VE3STP	Renfrew		6.34-7.06
VE3NRS	St. Catherines		7.07-7.67
VE3SAR	Sarnia		6.34-6.94
VE3SSM	Sault Ste. Marie		6.34-6.94
VE3SRS	Sudbury		6.46-6.94
VE3TIS	Timmins		6.34-6.94
VE3CDX	Toronto		7.93-7.33
VE3MOT	Toronto		6.58-7.18
VE3RPT	Toronto		6.46-6.94
			6.46-7.06
VE3SIX	Toronto		52.760-52.525
VE3SSS	Toronto		6.64-7.30
VE3TTY	Toronto		6.10-6.70
	(RTTY only)		
VE3HY	Waterloo		6.10-6.70
VE3III	Windsor		6.40-7.06
VE3WIN	Windsor		6.40-7.00

QUEBEC

VE2SP	Chicoutimi		6.46-6.94
VEZCSL	Matane		6.46-6.94
VE2ASU	Mont Buckland		6.70-7.60
VE2SP	Mont Jim Gray		6.46-6.94
VE2CAT	Montreal		6.10-6.94
VE2CLA	Montreal		6.10-6.70
VE2PY	Montreal		6.20-8.88
VE2RM	Mont Rigaud		6.40-7.18
VE2XW	Mont St. Bruno		6.70-7.60
VE2TA	Mt. Orford		6.52-7.50
VE2OM	Quebec		6.34-6.94
VE2VD	Quebec		6.16-6.76
VE2NY	Riviere-du-Loup		6.46-6.94
VE2ZD	Shawbridge		6.46-7.06
VE2SS	Sherbrooke		6.46-6.94
VE2AT	Trois Rivieres		6.46-6.94

SASKATCHEWAN

VE5FN	Lloydminister		6.46-6.94
VE5SS	Regina		6.46-7.33
VE5SK	Saskatoon		6.46-6.94

YUKON

(no repeaters currently listed in the Yukon Territory.)

AUSTRIA

OE5XGL	Altmuenter		4.15-5.75
	Graz		4.20-5.80
	Igmunden		4.15-5.75
OE7XTI	Innsbruck		4.15-5.75
	Klangenfurt		4.20-5.80
	Kufstein		4.20-5.80
OE5XLL	Linz		4.25-5.86
	Mattighofen		4.30-5.70
OE5XUL	St. Johann		4.15-5.75
	St. Poelten		4.20-5.80
OE2XSL	Salzburg/Gaisburg		
	Schladming		4.35-5.65
	Wien-Stadt		4.15-5.75

BERMUDA

VP9BA			4.34-4.94

CZECHOSLOVAKIA

OKØB	Cerna Studnice		5.225-5.825
OKØA	Prague		5.10-5.70

DENMARK

OZ3REN	Aalborg		5.05-5.65
OZ3REC	Aarbaus		5.35-5.85
OZ3REQ	Aarbaus		435.15-433.65
OZ3REO	Bornholm		5.05-5.65
OZ3REB	Copenhagen		5.15-5.75
	Copenhagen	T1.4 and T2.2	5.35-5.85
OZ3REK	Esbjerg		5.05-5.65
OZ8JS	Hadersley		5.35-5.65
OZ3REE	Herning		5.25-5.85
OZ3RET	Hjørring		5.25-5.85
OZ3REI	Knivsbjerg		4.15-5.75
OZ3REA	Lyngby		5.35-5.85
OZ3RED	Lysnet		5.15-5.75
OZ3REF	Odense		5.25-5.85
OZ3REJ	Ringsted		5.05-5.625

ENGLAND

GB3PI	Cambridge	T1.7	6.15-5.75
GB3BC	Pontypool		5.15-5.75

GERMANY

DBØWA	Aachen		4.20-6.80
DBØXA	Altenwalde		4.30-5.70
DB8ZA	Aschberg		4.25-5.85
	(Rendsburg)		
DBØUA	Augsburg		4.20-5.80
DBØYB	Bad Hersfeld		4.20-5.80
DB8VB	Bad Koenig		4.175-5.775
DBØXB	Baiderstrasse/Ostsee		4.20-5.80
DB8UB	Bamberg		4.20-5.80
	(Zusaetzlich 18)		
	Bamberg		431.30-438.90
DBØUG	Bentheim-Lingen		4.20-5.80
DB8XQ	Bergheim		4.25-5.85
WBØWF	Berlin		4.15-5.75
	(Funkturm)		
DB8YL	Berlin-Neukdelln		4.225-5.825
DB8SP	Berlin-Sp		5.15-5.60
DB8XN	Bredstedt		4.175-5.775
DBØWU	Bremen		4.25-5.85
DBØWC	Bremerhaven		4.20-5.80
DBØXY	Bucksherg/Harz		4.30-5.70
DBØYC	Cham		4.15-5.75
DB8UC	Coburg		4.15-5.75
DB8US	Damme/Vechta		431.35-438.95
DB8ZB	Ochsenkopf		4.25-5.85
DBØWN	Ochsenwang		4.225-5.825
DBØXO	Deggendorf		4.20-5.80
DB8WO	Deister		4.20-5.80
DBØWT	Detmold		4.25-5.85
DBØUM	Doerenberg/Osnahrueck		431.20-438.80
DB8ZR	Dortmund-Schwerte		4.20-5.80
DB8ZV	Dortmund-Schwerte		431.15-438.75
DBØXR	Dreilaendereck		4.20-5.80
	(Loerrach)		
DBØZO	Duerenberg/Osnabrueck		4.15-5.75
DB8UO	Duisburg		431.10-438.70
DB8WW	Duisburg		4.15-5.75
DBØXC	Elm		4.76-5.90
DBØXX	Elm		431.20-438.80
DB8VV	Erbeskopf		431.25-438.50
DB8WE	Essen		4.225-5.825
DBØVS	Feldberg/Schwarzw		431.30-438.90
DB8DX	Feldberg/TS		5.05-5.65
DB8UF	Feldberg/TS		4.15-5.75
DBØVE	Feldburg/TS		431.15-438.75
DBØYF	Feldburg/TS		4.10-5.90
	(RTTY)		
DBØVF	Frankfurt-Stadt		4.226-5.825
DB8XF	Freising		4.175-5.775
DB8UE	Fulda		4.175-5.775
DBØWG	Goeppingen		4.175-5.775
DBØZZ	Grab		4.20-5.80
DBØWM	Muenster-Westf.		5.05-5.65
DB8VR	Nordhella-Sauerland		5.075-5.675
DBØUL	Nortorf		431.40-439.00
DBØZN	Nuernberg-Moritzberg		4.15-6.75
DB8UN	Nuernberg-Schmausenbuck		4.225-5.825
DB8VN	Nuernberg-Schmausenbuck		431.05-438.65
	Ochsenkopf		431.20-438.80
DBØUO	Oldenburg		4.15-5.75
	Oldenburg		431.05-438.65
DBØUP	Pforzheim		4.225-5.825
DBØVP	Pirmasens		4.225-5.825
	Pirmasens		431.45-439.05
DB8YS	Siegen		4.20-5.80
DBØWR	Stuttgart		4.15-5.75
	Stuttgart		431.40-439.00
DBØWX	Triberg		4.20-5.80
DBØUT	Trier		5.175-5.775
DB8ZW	Weiden		4.20-5.80
DBØUJ	Wetzlar-Giessen		431.05-438.65
DBØWB	Winterberg		4.25-5.85
DB8WZ	Wuerzhurg		4.25-5.86
DBØZS	Zugspitze		431.25-438.85
DB8ZU	Zugspitze		4.275-5.725
DB8XG	Greding		4.20-5.80
DB8VG	Guch-Kleve		431.25-438.85
DB8WS	Guslar-Steinberg		4.25-5.85
	Guslar-Steinberg		431.30-438.90
DB8UH	Hagen-Westf.		4.175-5.775
DBØUR	Haltern		431.30-438.90
DBØXH	Hamburg		4.15-5.75
DB8YR	Hamburg		4.10-5.90
	(RTTY)		
DB8VH	Hannover		431.40-439.00
DBØWH	Hannover		4.15-5.75
DBØZH	Heidelberg		4.25-5.85
DBØYH	Hoechenschwand-Schwarzw		5.075-5.675
DBØWV	Hoechsten-Oberschwaben		4.25-5.85
DB8XM	Hoher Meissner		4.225-5.825
DB8YK	Homburg-Kaiserslautern		4.20-5.80
DB8XE	Kaddel		4.15-5.75
DBØZF	Kaiser-Freiburg		4.15-5.75
DBØXK	Kalmit		4.30-5.70
DBØUK	Karlsruhe		4.175-5.775
DB8UD	Knuell		431.40-439.00
DB8XU	Knuell		4.25-5.85
DBØZK	Koblenz		4.20-6.80
DB8VK	Koeln-Stadt		4.175-5.775
	(Zusaetzlich)		
DBØWK	Konstanz		4.15-5.75
DBØWL	Lahr		4.25-5.85
DBØWD	Leer-Ostfriesland		4.20-5.80
DBØYN	Lindau-Northeim-Hann		4.20-5.80
DBØYY	Ludwigsburg		4.30-5.70
DBØXL	Luebeck		431.30-438.90
DB8ZL	Leuchow-Elbe		4.20-5.80
DB8UI	Marburg		431.35-438.95
	Mayen		431.30-438.90
DB8UU	Melibokus-Darmstadt		431.20-438.80
DB8VD	Melibokus-Darmstadt		4.20-5.80
DBØXS	Merzig-Saar		4.25-5.85
	Merzig-Saar		431.10-438.70
DBØZY	Mintraching-Muenchen		
DBØZM	Muenchen-Stadt		4.15-5.75

ISRAEL

	Haifa		5.175-5.775

JORDAN

JY73	Amman		6.34-6.94

NETHERLANDS

PAØALK	Alkmaar		5.20-5.80

PANAMA

HP1PC	Panama		6.34-6.94

SWEDEN

	Bollnas		5.05-5.65
	Boras		5.20-6.80
	Falun		5.20-5.80
	Gallivare		5.05-5.65
	Goteborg		5.05-5.65
	Helsingborg		5.05-5.65
	Huskvarna		5.15-6.75
	Kalmar		5.20-5.80
	Karskrona		5.15-5.75
	Kiruna		5.20-5.80
	Malmo		5.175-5.775
	Mellerud		6.10-5.70
	Nassjo		5.05-5.85
	Rommeleasen	T2.172	4.90-5.80
	(So. Sweden)		
SKØDZ	Stockholm	T2.172	4.90-5.80
	Stockholm		5.05-5.65
	Stockholm		5.125-5.725
	Stockholm		5.20 5.80
	Sundsvall		5.20-5.80
	Umea		5.20-5.80
	Uppsala		5.15-5.75
	Ystad		5.20-5.80

SWITZERLAND

	Appenzell	T1.595	431.20-438.80
HB9B	Basle	T1.435	431.05-438.65
	Berne		5.05-5.65
	Fribourg	T1.29	432.05-438.92
HB9AA	Lucerne-Pilatus	T1.595	431.05-438.65
	Lucerne	T1.595	431.05-438.92
	Lucerne	T1.16	431.20-438.80
HB9H	Lugano		5.15-5.75
HB9FG	Neuchatel	T1.16	431.05-438.65
HB9CC	St. Gall-Santis	T1.595	431.20-438.80
HB9BA	Soluthurn	T1.16	431.20-438.80
HB9Z	Zurich	T1.16	431.05-438.65

. . .Staff

LETTERS

VOX POOP

I would like to see more articles on RTTY construction and use... WN3UTQ. *(So would we...wayne).* You should start a series for the beginners and show how to build a complete station from transmitter to transmatch...Mike Reid. *(Any budding authors out there to tackle this? ...wayne).* Circuits column should be expanded; would also like to see "idea articles on UHF and SHF experimental gear; and please consider more construction articles on SSTV and RTTY system...WB4NLM. *(Good idea...wayne).* I would like to see more 2m solid state FM receiver projects, more 2m FM transmitter and amplifier projects (solid state). 73 is a fine magazine with many fine technically oriented projects. Unlike QST or CQ, 73 is consistent with the needs of the builder, so keep up the good work...WB6ICR. *(Right on... wayne).* More specialized columns needed such as Novice, QRP. More general interest articles such as the one on Europe's repeaters and hamming in Jordan. Stay away from useless gimmick and gadget articles... WN9JOU. More Novice news, and how about some simple transmitters and VFO's, antennas, etc. Maybe a Novice column?...WN7WPH. *(We're game...any takers??...wayne).* 73 is great, groovy, grand, FB and OK... DA1SM. Your issues carry more VHF information than I care to read about. Let's get hams building more things...K6SLM/5. *(We print what is sent in...wayne).* Thanks for the material to bombard my representatives in Washington...W2RRJ. I would like to see some QRP projects...WN9JYU/4. One thing I like about 73 is the lack of contest results and junk like that. I want repeater control systems and construction articles...VE1NU. More Oscar operating info for us beginners please...WA7QED. Would like more articles on modules. You have a great magazine...WA9SYK. *(OK all you module lovers, start writing for Lorain WA9SYK and other module fans... wayne).* The variation in articles from issue to issue is very good. I'm very pleased with your format, keep up the good work...Reynolds ME. Just right on general interest articles, but let's have humor articles every other month...WA7ADD.Whatever happened to tubes? A lot of us still use them and like them better than solid state, also they are much easier to get... WA8HGS. You are #1...WA9NQW. I wish you would stop "wasting" a whole issue on 2m FM. The HF bands are still alive, and how about some SSTV?...WA2DRL. The New Products review of the MITS 150 was very good and I hope to buy one soon. Also appreciate ads from Circuit Specialists, Meshna, Selectronics and Amateur Wholesale...Gerttula OR. Where in hell is the subscription blank?...W2ZTT. *(We didn't have room for it...wayne).* Keep the girlie pix off the cover. Don't agree with most of your editorial opinions, but every activity needs "radicals" to keep the rest of us honest!...WAØUVX.

Female adornment on the covers? By all means yes!...R. Harper. Construction projects are excellent. I am working on some and learning a great deal more about electronics. FCC regs are an excellent addition to 73 and invaluable...WN6SUW. *(Radical? I'm a hidebound conservative, it's only by comparison with ARRL that I appear a radical...wayne).* Would like to see some solid state construction articles on microwave, especially at 2300 MHz...Niggemann FL. *(Good idea. If anyone is doing some please note and start writing...wayne).* How about some simple 2m portable projects? How about something on towers, antennas, etc. (homebrew)...WN4CJP. *(Love to, but need more and more articles on some... wayne).* Great idea printing frequency allocations in each issue – real handy. How about charts and tables that can be cut out and put on the wall? Keep up the editorials Wayne, it's the best part of the magazinee...WBØFZL.

(Any chart and table writers out there?...wayne). I like digital devices and you seem to do a good job in this field...WA7GRI. More logic articles...WB4NXW. You need more projects for the beginner in radio... WN6UKK. *(I agree...wayne).* How about an article on high speed digital TV? And more experimental stuff... W. R. Stephen. *(Any volunteers?... wayne).* I appreciate the reader service section and the large amount of consumer information...WA9TBW. Like to see more articles like Jordan. Best I've ever read in any ham magazine. Also, every DXer should read the QSL manager by W4NJF...K6QPG. Need some articles on 6m FM transistor projects. Great magazine... WA4CKO. I would like to see complete networks for FM and TV across the U.S. through the repeater system. More circuits and theory for both of these expanding fields...K8VSI. More of your excellent FM articles... WB8IMC. How about some tech data on RF power VHF transistors?... WB5HHZ. Would like to see more product reviews...WA7KKP. Touchtone accessories for repeaters would be nice...WB6SFL. How about a surplus conversion column?... WBØCUN. 450 MHz FM news and construction articles...WB9DGT. More articles on exotic aspects such as moonbounce, super contesting, etc...WB8JAJ. More attention to HF, which still has the majority of hams...W8ZZZ. More ATV... WØYRE. More on SSTV and digital...WB8KPS. More HF and less 2m FM...R. N. Wert.

GET THE DRIFT?

Does anyone know if the SP-600JX-17 Hammarlund receiver has a very severe drift problem *by design?* This problem in my receiver is only present between 14.220 and 14.350 MHz. Many hours of troubleshooting have failed to find the cause. Also, before I spend more hours again, do all of the s-meters read downward on modulation?

Ken Branning K9RSF
3419 Senate Ave.,
Ft. Wayne IN 46806

MAYBE THIS TIME

Please send me your 14 WPM code cassette in exchange for my $3.95 check.

I have been trying since 1970 to pass the 13 WPM test, and just this week failed it again. At $9 a test, $10 for gas, $20 per night in Detroit, I figure I've spent almost $200 so far and have not been on the air since my WN8HAK expired in June of '72.

When you get to be 40, have two teenagers running around with 140dB rock on, and then with going to school myself to get my Engineering Masters during this period, for some reason the code won't sink in.

At least I'll finish my Masters with a 3.98 point average thru all this, have been promoted (?) to a job that gets me out of town one night a week and managed to get an FCC 2nd Class Commercial Ticket.

Now, once more for that ham ticket, if the fuel shortage doesn't stop me.....!

Donald Upp Ex-WN8HAK
Trotwood OH 45426

NEVER TOO LATE

Being a Novice (albeit 55 years old) who has recently found time to start, I was interested in finding a magazine which would help me move towards the General Ticket. So far, with 3 copies of 73, I find 99% of the articles "way" beyond me.

Is it possible that some small portion of each issue could be used to help inform us Novice types?

W. J. Elperin WN0LDN
Kirkwood MO

We are currently looking for a Novice Editor for the Newspages. Any takers? If more Novice articles are sent in we will accept more and publish more. We can't publish them if we don't have them . .ed.

MORE SCANDAL?

I enjoyed reading about the 'Non Ham SCM Election.' There has been a similar happening here in Montana. First of all out here in the "Great Conditional Frontier" one can obtain a Conditional license by several under the table techniques. Recently the FCC was pressured into re-examining some of the Conditionals here in Montana. After many letters to the FCC in regard to this illegal licensing of Conditionals, we got tired of the same old answer "still under investigation." Finally we sat down and contacted one of our Senators. He stated he would look into the matter. Within the week we received a notice from the FCC that a number of Conditionals would be recalled for examination.

One of the persons recalled by the FCC was a past SCM, W7SFK. W7SFK contacted the FCC and stated he was unable to appear for examination due to extreme illness. After getting this information back from our Senator we obtained a letter from W7SFK's employer, the county sheriff. The sheriff stated, "No, he has been in real good health and has been doing a good job as a deputy sheriff." After getting this information it was once again filed with our Senator who dropped the entire matter back into the lap of the FCC. Shortly after, W7SFK's license was cancelled.

The FCC received all kinds of excuses from the ones they recalled; some had been ill, some had taken the wrong medication and couldn't appear, and one claimed that he was financially unable to appear. This last person at the time was vacationing in Arizona. It is time the amateurs put a little force on the FCC through their Senators and Representatives and get some action where it is needed.

If the FCC got rid of all of the unqualified mail order hams, there would be no need for incentive licensing programs. The FCC reports that less than 7% of all mail order licensees are qualified. I personally feel it is time to get rid of all the illegal hams. Hopefully the FCC will continue to recall these amateurs.

If the FCC started by recalling all the hams listed in the Montana column of QST there might be a lack of League Officials left in Montana. Out of this column only about seven hams are ever mentioned. These, of course, are the clique that operated with our Conditional class SCM.

Let's all get together and force out these unqualified so called hams!

Name Withheld

INFORMATION PLEASE?

Can anyone advise me as to whom to contact about participating in the OOT (fifty year) Amateur Radio Club?

Eric G. Hook
Monitor Liquid Level Indicators
Westford Massachusetts
01886
617-692-8335

AMEN

Amen to your article in the February 1974 issue of 73. The article I have in mind deals with the IRS and their unlimited power. Please keep this type of article coming!

I am a chemical engineer and as such purchased an HP-35 calculator for my work. The cost of this unit was $303. I asked the IRS if I could deduct this cost since this unit was necessary in my work. Their answer was yes if you depreciate the cost over 10 years!*CAN YOU BELIEVE THAT!?* I then asked the same question to another IRS agent who told me to depreciate the unit over 5 years. A third IRS agent said to take the whole amount!!!!!! Who do you believe?

I have had friends who have been under an audit by three agents at different times covering the same return and have been given three different judgements!!! *CAN YOU BELIEVE THAT!?* Needless to say, something must be done to correct this situation. What can the "little guy" do?

Name Withheld

We believe it. . .ed.

NON-INTEREST

I am really not interested in your problems with the IRS. I subscribe to your magazine to read about amateur radio.

E. F. Munsell K6CL
Los Angeles CA 90066

So you lose a page. . .ed.

COMMENDATION

I would like to commend you on the excellent magazine. I always enjoy reading 73. I'm 100% in favor of your series of editorials re the "Jolly Roger" branch of the government. I am able to see reasonable taxation for the support of the government (etc.), but when it comes to having to tolerate Cossack tactics, I must object. You have my total sympathy re your relationship with the "International Renegade Society." They should definitely have their wings clipped. I would welcome a series of articles on other forms of governmental snoops and henchmen with perhaps, listings of their confidential telecommunication frequencies. With domestic political discrepancies such as the "Watergate," the citizens do not feel especially close to the action. But when the Cossacks drag you down into their local pit for fun sessions with the thumbscrew playthings, or even worse, if tribute is demanded from the wallet, one feels as if he is in the middle of the "Battle of Tannenburg!"

You have compared the IRS to the good old Gestapo, but there is another equally accurate comparison, that being the "Inquisition." It seems that the IRS retains a modified version of the old practice of burning dissidents at the stake.

Changing to another topic. I appreciate the inclusion of ciphers in past editions, and look forward to seeing them in the future. Please do not publish my name as I do not wish to have the Cossacks effect a pogrom upon me. The forced labor camps are very cold this time of year (Newspeak translation from 1984 ("joycamps").

Name Withheld

TIY XLB RTOW RGWAW XETORA PYUXJKT QGWB TIY YAW L RTOWQEURWE LBS IDDAWR IBW KWRRWE. AXEWQ UEA. . .wayne.

IRS SERVICE?

I have been reading with much interest your editorials concerning the operation and policies of the IRS. This comes at the end of my first year of being "self-employed," and discovering that there is more to income tax than a W-2 and a standard deduction.

While my business may not yet be as large as 73, I find that we are all faced with the same governmental institution looking for our money. In an effort to understand how it works, one needs information about the "Service(?)." I am in support of your efforts, and apparent courage to find out more about this rather large, powerful, profitmaking organization.

Name Withheld

anywhere make sure that they have some technical advice. . .or let me know and I'll parlay it into a free trip to California and make sure they don't screw up like that again. We need all the good PR we can get. . . and there are a thousand interesting stories that could use ham radio. . . maybe a hundred?

The firms who bankrolled this attrocity were Jello, Pabst, Janitor in a Drum, Pam and Holiday Inns. Let's let them all off easy by organizing an avoidance of these products for only one year. No more Jello. No more Pabst (I guarantee not to drink Pabst ever again). No more Drummed Janitor. No Pam (I use bacon grease anyway). And to hell with Holiday Inns. . .unless they advertise in 73.

And may the great sacred eagle of the United States deposit vast quantities of quano on Sy Salkowitz for writing this lame-brained episode.

CB RADIO MADE TRUCK STRIKE POSSIBLE

Just two years ago such a strike would have been impossible. The recent massive use of CB to foil the police radar speed traps by truckers gave them the communications which made the strike work.

Articles have appeared in the newspapers all around the country on the use of CB radios by truckers to warn each other of police traps (smokey-the-bear is the code). CB radios have been selling like pep pills at truck stops and, since there is virtually no way for anyone to prove anything, few have bothered to pay the S20 for the CB license. Why should they? Once they get the CB ticket they come under the rule of the FCC. . .if they don't get the license it is up to the FBI. . . and the FBI record for tracking down illegal mobile radios is zilch.

About the only serious problem the truckers have been having is with high powered skip stations jamming them out for local communications. If the FCC goes ahead with the 224 MHz CB band this should solve that nicely and open a relatively interference-free band for organizing illegal activities. It will also be a God-send for crooks, who have been struggling to use 11m, but have had problems with skip interference.

CLEANING UP CB

If we are to donate a segment of our 220 MHz band to our good buddies who are now using our old 11 meter band, perhaps we should help them a bit by giving them a hand with the enforcement of their rules. There is no reason why a few bad eggs should spoil things for everyone, right?

A letter from W5OJZ explains the details. It seems that there are two parts of the Communications Act that are being fractured by these over enthusiastic pals of ours. Those who have gone to the expense of buying a valid CB license ($20) and proceed to run more than five watts, put up two big antennas, not give their call signs, talk base to base, use foul language, coordinate illegal activities and other such rather popular CB goings on, are in violation of Section 301 and the FCC is the enforcer of the rules.

The FCC is badly understaffed, so they can use all the help you can give them. They'll want to know the name, address, call sign (FCC issued), dates and times of violations and the nature of the violations, how the party was identified, and any other pertinent facts. This information should be sent to the Chief, Safety and Special Radio Services Bureau, 2025 M Street NW, Washington DC 20554, Attention Legal, Advisory and Enforcement Division, Room 5202.

CB'ers who do not have FCC licenses are in violation of Section 501 of the Communications Act and the responsibility for them lies with the Department of Justice. . .that's the FBI. You'll find your local FBI office listed in the phone book. They will want to know the name and address of the violator, when he was on the air, and tape recordings or whatever else might be available. They will also want identification from you.

So there is one answer to Fat Albert down the block — call the FBI!

MORE TECHS BUSTED

The FCC vendetta against Techs and Conditionals continues briskly, with many losing their licenses.

One Tech recently wrote that when he appeared for the FCC exam, per their request, they said that all they had was the 13 wpm tape and told him to pick out five characters from it. He protested that he couldn't copy more than 5 wpm, but they went ahead with the 13 per tape, which threw him into a panic. . .and he got no copy. Then, after he was thoroughly rattled, they found their 5 wpm tape and ran that for him. . .and flunked him.

It's tough enough when everything goes right to pass the code test. True, our Tech reader would have done far better to bone up on his code via the 73 6-wpm practice cassette. . .there's no way they could have thrown him then. If you think you may be called up for retesting you could do worse than get one of these tapes. Better get it now while there is time to practice than suddenly get the word from The Man that Exam time is Here!

MORE LOSSES COMING

One of the more cryptic comments dropped by the FCC was that the CB grab for 220 MHz and the emergency medical try for 450 MHz were only starters, that we would be seeing several more even more serious pushes to get our ham bands. Remembering the recent utter loss of virtually all our satellite bands, a loss which will come to haunt us in years to come, one wonders at the situation. We lost the satellite bands because we did not prepare adequately for the ITU conference. They did not have to be lost and ther loss could have been prevented.

Yes, I know these are things that most amateurs don't want to read about, don't want to think about, and don't want to do anything about. I can see the situation, and *I* don't know what to do about it. I know of no way to get the League to do these things and I don't see anyone else around to do them.

OTHER RULE CHANGES?

The repeater rules a la Docket 18803 are not the only bones of contention between amateurs and the FCC. There are not a few amateurs who are seriously concerned over the new third party regulations, which are over restrictive and tend to inhibit the public services that amateurs can provide. Where such restrictions serve a useful purpose, there would be little objection — but this doesn't seem to be the case. Perhaps it will be possible to reopen consideration of this situation and work toward an amendment of the third party regulations.

What other rules fit into this category of being over-restrictive to no good end?

HATE WAYNE GREEN CRUISE PLANS

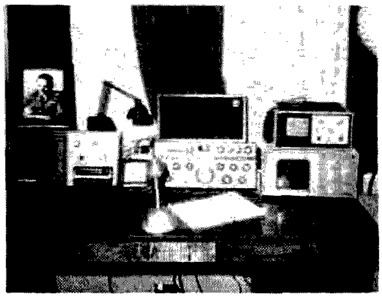
Plans are in the works for a giant free cruise to the Bermuda Triangle for registered haters of Wayne Green. If you or a friend think you qualify for this select group all you have to do is write ten reasons why you hate Green and send them to 73 Magazine, Hate Contest Department, Peterborough NH 03458, and wait for the decision of the impartial judge. All entries become the property of 73 Magazine.

CANADIAN OPERATION

Why leave amateur radio behind when you go to visit Canada? Getting a license to operate there is a snap. Send a letter for an application to the Department of Communication, 55 St. Clair Avenue East, Toronto 290, Ontario, Canada. Don't forget to give you name, call, address, and class of license. You'll get your forms pronto.

INSTANT SLOW SCAN PROGRAMS

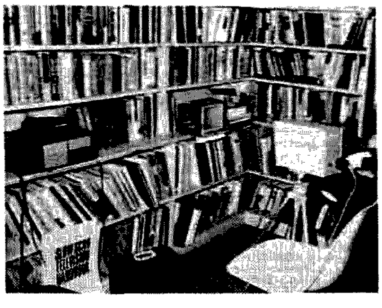
The Slow Scanner has a problem with flexibility. Programs can be made up ahead by means of tape, but once made it is difficult to ever change them. Some amateurs do their programming "live" by panning their camera to a menu board, then to themselves for a frame or two then to some photographs, then a magic marker sign. . .etc. This keeps a person hopping, and it gets old quickly.



On the left is the SBE Slow Scan unit, complete with tape recorder. . .in the middle is the Signal One. . .the Robot Slow Scan monitor on the right, and the Venus Slow Scan monitor is on top of the Robot. The result is that incoming pictures can be viewed on all three monitors for comparison. The SBE unit camera is used with the slide projector and the Robot camera is used for menu board work and live shots of the harried operator. The Venus camera has not arrived as yet.

One way to get programs together is via 35mm slides and a projector. While color slides do work passably, better results are obtained with black and white positive slides. These can be made with ordinary black and white film and an inexpensive reversal kit which changes the resulting negative into a positive. The slides are then mounted normally.

The slide projector is then focused on a rear projection screen and the Slow Scan camera merely takes the picture of the screen. I use a small 90° mirror with a ground glass screen built in, made by Hudson Photographic Industries and available from several mail order houses.



The projector is at the left. . .the right angle rear projection screen is in the middle and the camera is at the right. This is right beside the operating position so the camera can be swung around for live shots if desired.

By keeping the projector remote control at hand I can show each slide as many times as band conditions dictate. Where I have a closed circuit contact I show each one once. . .on DX I may give them three or four chances at it. And it is simple to update programs just by rearranging the slides.

This system has proven to be first rate. It is vastly superior to my first scheme of taking the slow scan camera around and taping pictures here and there. The 35mm camera is so much more portable and flexible than the Slow Scan camera and monitor.

BEWARE!!

All of the rip-offs in amateur radio are not in the ads in the other ham magazines – some may arrive by mail. One forwarded by K2OAW is a recent effort to part you from your cash by one A. Vance Williams, Inc., of North Carolina. Williams says in his letter that he is running a very successful business – half a million bux last year – and has some common stock for sale at S1 per share. The letter mentions radio amateurs and apparently is being sent to hams.

Since such stock has to be registered with the SEC, and there are all sorts of legal problems in selling it over state boundaries, I didn't even have to note the lack of anything but a rubber stamp letterhead and several misspelled words to develop suspicions. The Phone Company in Jacksonville said they had no record of a Williams Inc., or even a Williams at the address given. I forwarded the stuff to the Fraud Division of the Post Office.

Reminds me of a gimmick a few years back where amateurs would get a letter on a clipping service letterhead (appropriately named, I thought) saying that they had a clipping on hand from a national publication mentioning the amateur and that it would be forwarded for a small service fee. And what did they get for their buck? Their name and address clipped out of the Callbook Magazine!

OCEANUS CALLS

Ship registry forms are now available for registering any craft with Oceanus. Your Oceanus amateur radio call may then be used aboard that craft outside of the three mile limits of any land. Any ship may be registered under the Oceanus flag, from a row boat to an ocean liner to an airplane, and this registration does not supercede any previous registration, nor does it call for the display of the Oceanus flag.

Oceanus call letters are being issued by the Chancellor of Communications of Oceanus, 73 Magazine Street, Peterborough NH 03458. They are being issued in order starting with O1AA. A copy of your valid amateur radio license together with a statement that you wish Oceanus citizenship and that it is not to supercede your previous citizenship and a S5 fee made out to Oceanus will bring you your amateur license, your Oceanus call letters, your Oceanus passport, and a registration form for a ship to fly the Oceanus flag.

OCEANUS CALLS

O1AB	Robert K. Vonier	W6ISV
O1AC	Joseph Sauerzapf	K8HNL
O1AD	Charles E. Deckard	WN4FAR
O1AE	Michael J. Eisenstot	WA8ARZ
O1AF	Barbara B. Thompson	KH6ICQ
O1AG	Noel J. Thompson	KH6FOX
O1AH	Carl P. Van Court	K1RCD
O1AJ	Stan Dunn	WA3PHQ
O1AK	Raymond T. McKeever	W1WJR
O1AL	Elaine P. McKeever	WA1LUT
O1AM	Steve Radgowski	WN2RMO
O1AN	William C. Spenn	WA5QVD
O1AO	David F. Reed	WB5GDL
O1AT	Jimmy Powell	K5UHM

HOTLINE NEWS NEEDED

The 73 HOTLINE will publish the last minute news of hamfests, conventions, and other ham events. . .if you send them in. Please let us know your plans for speakers, exhibitors, and other important aspects of your events. The HOTLINE will get this news to the readers within a few days. . .as a matter of fact, the HOTLINE will be in the mail within a few hours of the last minute items being received. Deadline for news is the Wednesday before publication and the HOTLINE will come out every other Friday starting April 5.

Any events of note should be sent in, preferably with photographs. . . emergenciess handled. . .repeater updates. . .FCC petitions entered. . .DXpeditions mounted. . .etc.

CARNETS

While many amateurs have had no problem carting their rigs from country to country, what with a minimum of customs inspection being the norm for most countries, the peace of mind of knowing that even if you should be inspected you would get through quickly and without cost is worth the effort in getting a carnet.

A carnet will cut the red tape when you want to take along any radio or other professional equipment when visiting other countries. The carnet system is used by salesmen and engineers for taking samples and other gear from country to country.

The carnet is issued by the International Chamber of Commerce and can be gotten by mail. The average cost of a carnet for ham gear would be about $60. Full information is available from the ICC, 1212 Avenue of the Americas NYC 10036.

Caveat Emptor?

Price – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

DAYTON HAMVENTION expands to three days April 26, 27, 28, 1974 at HARA ARENA and Exhibition Center. Brochures mailed March 15th. Write for information if you have not attended the last two years. P.O. Box 44, Dayton, Ohio 45401.

FREE CRYSTALS with the purchase of any 2m FM radio. Write for our deal on the rig of your choice. Factory-authorized dealers for Regency, Drake, Kenwood, Tempo, Genave, Swan, Clegg, Ten-Tec, Standard, Midland, Hallicrafters, Galaxy, Sony, Hy-Gain, CushCraft, Mosley, and Hustler. For the best deal around on HF or VHF gear, see us first or see us last, but see us before you buy. Write or call us today for our low quote and become one of the many happy and satisfied customers of Hoosier Electronics, R.R. 25, Box 403, Terre Haute, IN 47802. 812-894-2397.

CURTIS ELECTRODEVICES and Madison Electronics present the finest in CW devices: EK420A CMOS Deluxe Keyer, $139.95; KM420 CW Message Memory, $299.95; KB4200 Keyboard Morse Generator, $499.95; Write literature. Brown and Vibroplex paddles. All prices F.O.B. Houston. Free flyer. Madison Electronics, 1508 McKinney, Houston TX 77002. 713-224-2668; Nite 713-497-5683.

YAESU FT101. Excellent condition, with manual and Yaesu desk mike, $475. Will ship or deliver. K. J. Clatanoff WAØYCC/1, 88 Farm Lane, Portsmouth, NH 03801. 603-436-6675.

ROCK RIVER RADIO CLUB of Dixon IL announces their 8th annual Hamfest on April 28, at the Lee County 4-H Fairgrounds, one mile east of the junction of US 30 and IL 52, in Amboy IL. Tickets $1.50 in advance, $2 at the gate. Talk-in on .94.

EQUIPMENT FROM 73

The following list of gear, unless otherwise noted, consists of brand new equipment purchased for testing purposes only. Some have been tested, some remain unopened in original cartons. We are offering this gear at a considerable discount on a first-come-first-served basis. Please send Money Orders or Certified Checks only to 73 Magazine, Peterborough NH 03458.

MITS 908M Calculator w/p.s./case ($143) new	$ 110
Logiclocks ($120 new) 3/4" numbers – 6 figs	$ 75
Heath IB-101 counter ($170) – 5 figs	$ 140
Vanguard Scaler by 10 to 200 MHz ($120)	$ 75
Midland 220 MHz xcvr – brand new – ($220)	$ 180
Clegg 21 220 MHz xcvr – new – ($300)	$ 235
Regency 16ch scanner TME-H-LMU ($300) – new –	$ 245
Waller 60A p.s. brand new ($125)	$ 99
SOE Scanvision, complete, like new ($900)	$ 600
Robot Monitor – new – ($296)	$ 240
Robot camera – with micro-focus gear – ($330)	$ 250
Pickering CW keyboard KB-1 ($265) – tested	$ 175
Heath HW-202 – brand new – ($180)	$ 165
Heath HA-2022 amplifier new ($70) – built	$ 65
Gladding 8ch scanner – Cheyenne – brand new – ($150)	$ 99
Gladding Hi-Scan – 8ch scanner – tested ($180)	$ 99
Genave GTX-2 – used – ($250)	$ 180
Motorola KW 2m amplifier – used	$ 350
Heath IC-2009 calculator – brand new ($92)	$ 88
SBE-450 xcvr – new – ($450)	$ 299
Standard 1400 2m 22ch xcvr 10w ($550) – used	$ 250
Heath HWA-202-1 power supply – new – built ($30)	$ 25
Signal One CX7-A – tested – perfect – like new – fantastic	$1990
Kenwood Twins – Tested – like new ($900)	$ 750
Standard 146 2m HT – used ($289)	$ 190
Fannon intercom – exec – 6 cb master – ($60) tested	$ 35
Genave GTX-200 – used ($270)	$ 180
Icom IC-30 6m xcvr – brand new ($400)	$ 299
Icom IC-60 450 MHz xcvr – brand new ($375)	$ 275
Concord TV camera MTC-15 ch5-6 output tested ($500)	$ 250
Concord video monitor VM-12 tested ($400)	$ 250
Concord all channel TV tuner Dem-911 ($600)	$ 250
Concord VTR – like new – fantastic ($400)	$ 300
Bell & Howell 2966 VTR – like new – excellent ($995)	$ 350
Bell & Howell 2965 portable VTR – new ($1595)	$ 475
Batteries for B&H 2965 – like new ($36)	$ 25
Clegg 6.5A power supply ($80) – brand new	$ 60
Vanguard 2m preamplifier – used – ($25)	$ 15
Vanguard conv 223.34 MHz – brand new – 407 ($55)	$ 45
Tempo CL-220 xcvr – new – ($329)	$ 220
Tempo FMH charger – ACH – brand new – ($30)	$ 20
Caringella Rx – WWV – 5-10-15 MHz – tested ($75)	$ 45
Regency 450 MHz scanner – ($200) like new	$ 140
Varitronics PA-50 2m amp ($110) – brand new – 10w in 50 vout	$ 75
RP tone burst gen – 5 freq – TB-5 – exc ($37.50)	$ 25
Electro-Voice 717 noise cancelling ceramic mike – new ($13)	$ 10
Hitachi cassette recorder – excellent – ($00)	$ 35
Hitachi stereo cassette recorder – exc – ($120)	$ 75
Hitachi AM-FM-cassette recorder – exc – ($90)	$ 50
Regency HR-2 xcvr – used	$ 145
Turner mike – noise can NC350DM – brand new	
Vanguard preamp 201 – 52.525 MHz ($25) – new	$ 18
Vanguard preamp 202 – 450 MHz ($29) – new	$ 23
Vanguard conv 144-146/14-15 MHz =407 – new – ($50)	$ 40
Vanguard conv 144-146/28-30 MHz =407 ($50) new	$ 40
Vanguard conv =407 146.94/10.7 MHz new ($50)	$ 40
Antenna Spec rubber ducky antennas HM-4 2m	$ 4
KLM 2m amp PA-2708 – brand new ($150)	$ 125
SWR meter – exc ($26) KW	$ 12
Test Labs – 10 in 1 – SE-400 ($25) as is	$ 10
Control Signal ID unit – brand new ($50)	$ 35
Concord stereo recorder-changer – 12 cassettes ($240) brand new	$ 135
VTR Monitor – exc – Hitachi ($225)	$ 125
Video tape – new – per roll ½"	$ 10
Radio Shack Code cassette – new ($6)	$ 4

All prices fob: UPS collect.

73 Magazine – Peterborough NH 03458

THE TRI-STATE ARS WILL hold their annual hamfest on May 18, 1974, at the 4-H fairgrounds, U.S. 41, three miles north of town. Overnight camping, auction, flea market, door prizes and ladies bingo. For information or advance registration contact: Steve WB9MDB, 5805 Berry Lane, Evansville IN 47710.

GE POCKETMATES See Oct. 73 issue. Physically complete, less batteries, not checked out. Some with 2 frequencies, some with tone transmit: Supplied with schematics and cassette tape on servicing unit. Shipped postpaid and insured, $70 each. F.J. Pritchett, 130 North Oxalis Drive, Orlando FL 32807. 305-275-1144.

SELL VHF GIR: For list send SASE to Ewell D. Pendergrass WA5AER/5, Rt. 1, Box 250F, Apt. 4, Fort Smith AK 72901.

HAMFEST! Indiana's friendliest and largest Spring Hamfest. Wabash County ARC's 6th Annual Hamfest, May 19, 1974, 4-H Fairgrounds, rain or shine. Admission still only $1 for advanced tickets ($1.50 at gate). Large flea market, technical sessions, bingo for XYL's, free overnight camping, plenty of parking. Bonus for car-pools (4 or more adults per car). For more information or advanced tickets write: Jerry Clevenger WA9ZHU, Route 4, Wabash IN 46992.

GREATEST of them all! That's the ARRL 1974 National Convention, sponsored by Hudson Amateur Radio Council. Remember the dates – July 19, 20, 21 at the Waldorf-Astoria, New York City. Three days of exciting events!! Wide array of demonstrations, exhibits and forums featuring latest in FM, SSTV, ATV, RTTY, FAX, Satellites, Antenna design, Transistors, Integrated Circuits, DX, MARS, ARPSC and much more. Something to do every exciting minute for YLs & XYLs – Tours, New York sightseeing, visits to popular TV shows, Parties, Fashion Shows. Meet the ARRL President, Vice-presidents, and all 16 Directors! Famous-name Speakers at Saturday Night Banquet! Everything for the Non-Ham, New Ham and Old Timer. For Info, Contact: ARRL Convention, 303 Tenafly Road, Englewood, N.J. 07631.

KLM AND MADISON ELECTRONICS present the finest in VHF antennas. 144-148MHz, 7-element to 16-element; 9-element, $31.95; 14-element, $45.95; 16-element, $49.95; 220MHz; 420 450MHz, 14-element, $19.95; 27-element, $41.95. Write literature. All prices F.O.B. Houston. Free flyer. Madison Electronics, 1508 McKinney, Houston TX 77002. 713-224-2668; Nite 713-497-5683.

GENERAL ELECTRIC: 80W TPL, 2m, 2 frequency, with 94, manual, accs., $175. Motorola mocom 30 450 MHz with PL, $100. TU532A base mic mint, $20. Heath HW32 20m SSB transceiver $75. HO-10 monitor scope, $30. Misc. Motorola and GE control heads and cables. D. Benischek, 4185 Arch Drive, # 317, Studio City, CA 91406.

FANTASTIC VALUES: Regency HR2-MS like new $190, Regency HR-6 good condition $150, Lafayette HA-750 good condition $60, Collins R-390A bad 2 kHz filter $390, R-391 very good $500, Galaxy V Mk2, DCPS $250, Polycomm PC-6 very good $80. George Misic, 37370 Windy Hill Drive, Solon OH 44139. 216-831-4152.

HT-220's – 2 frequency 2 watt slimline carrier squelch; $350 – 6 frequency 2 watt "E" model omni with "PL" ; $600 – both units with Nicad battery and heliflex antenna. Tom Williams WB4NXQ, 204 Foxboro Drive, Madison TN 37115.

BUY-SELL-TRADE. Write for monthly mailer. Give name, address, call letters. Complete stock of major brands, new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc., SSB & FM. Associated Radio, 8012 Conser, Overland Park, Kansas 66204. 913-381-5901

YAESU FTDX560 transceiver w/mike, speaker, cw filter. 2 years old w/manual. Flawlessly immaculate, $687 new – asking $437. Jeff Goodman WA1QLK, 15 Greenough Street, Brookline MA 02146. 617-734-0661.

MOTOROLA PORTABLES – Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal Services, 6663 Industrial Loop, Greendale WI 53129.

VERY INTERESTING! Next 5 issues $1. "The Ham Trader", Sycamore, IL 60178. (Ask about our "HAM EQUIPMENT BUYERS GUIDE" covering Receivers, transmitters, transceivers, amplifiers 1945–74. Indispensable!)

FOR SALE: Heath RX-1 receiver/speaker – $100; Heath HG-10B VFO – $35; Heath HD-10 keyer – $20. Walter Briggs WA2MQF, 25 Jill Terrace, Succasunna, NJ 07876.

R-390A – MINT – Like new with SPARES and manual, $450 (R-390A, excellent condition, checked perfect, $350 w/TM). Products, P. O. Box 36, Sweet Valley PA 18656.

MOULTRIE AMATEUR RADIO KLUB, 13th Annual Hamfest, Wyman Park, Sullivan IL, April 28, 1974. Indoor – Outdoor market. Ticket donation $1 in advance – $1.50 at the door. For information write: M.A.R.K. Inc., P. O. Box 327, Mattoon IL 61938.

PRINTED CIRCUIT TECHNIQUES FOR THE HOBBYIST. Ferric chloride "suspension etching," cutting epoxy glass, screen printing, etc . . .BOOKLET $2. TRUMBULL' 833 Balra Dr., El Cerrito CA 94530.

WANTED HIGH VOLTAGE transformer for Collins KNS-1. Jule Gordon W8HBQ, Box G, Moundsville WV 26041.

FOR SALE TX-62 and 621 VFO, NC-300 (rack mount) 2 meter conv, speaker and relay, $225. New 4H4-c tubes, $5 each. K1ZKR, 203-935-5762.

3-400Z LINEAR w/power supply, similar description September 1969,73, $150. Pictures available for SASE. 4-400A, 5vct, 30A filament transformer, $30. Shipping charges extra. Want cabinet similar DX100, Apachie, Mohawk. Bill Taylor, P.O. Box 485, Bettsville OH 44815.

ROCHESTER NY – The largest Hamfest in the northeast on May 17 and 18. Get your name on the mailing list. Write: WNY Hamfest, Box 1388, Rochester, NY 14603.

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding. Literature. Estes Engineering, 543-A West 184th St., Gardena CA 90248.

SWAN 240 with dc power supply and TCU power supply, vertical 10-80 antenna, complete station $275. W5PBO, 405-634-2513.

FOR SALE: 432 HANDIE TALKIE SR-C 432 2 watt 6 channel with case $270. 2m Handie Talkie SR-C 145B 2 watt 5 channel with case all new $230.. Joe Gibson, P. O. Box 442, Wallingford CN 06492.

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ANTIQUE RADIO BUFFS. Do you need a schematic for your radio? For information send SASE showing make and model number. Joseph C. Crockett K3KUL, 762 S. Gulph Road, King of Prussia PA 19406.

NEW $220. never assembled fiberglass 3 element quad 10-15-20. Pick up, will not ship, $140. A. S. Coverdale K2TSB, 39 Vivian Court, Lakewood NJ 08701 201-892-7075.

FAX PAPER: For Desk-Fax, new (not surplus), precut (not rolls), $15 per thousand sheets, postpaid worldwide. Bill Johnston, 1808 Pomona, Las Cruces, New Mexico 88001.

WANTED 51S1, serial above #500, excellent condition with manual, boxed, delivered to airline. State serial and condition. Arthur S. Cohen, Risco No. 437, Mexico 20., D.F. Mexico XE1LL.

TRADE Gonsett 2m sidewinder with ac supply, in perfect condition, for a miniature tv set, same condition. Bob Montgomery WA9CDG, 1345 Stanley Street, Stevens Point WI.

WANT – data and parts for "ACME" facsimile machine Model FNP-IS. Edward L. Radtke WA4BQE, 1602 Woodluck Avenue, Louisville KY 40205.

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SWAN 500CX with 117-xc power supply, $535. Includes shipping. KL7HOQ, Box 6, Talkeetna, AK 99676.

TECH MANUALS – $6.50 each: R-220/URR, R-274/FRR, R-390/URR, URM-25D, URM-32, TT-63A/FGC, CV-591A/URR, TS-382D/U, TV-2/U, BC-779B, TS-497B/URR, TS-413A/U, SP-600JX, TS-34A/AP. W3IHD, 7218 Roanne Drive, Washington DC 20021.

HEATHKIT SB-100 TRANSCEIVER. HP-23 ac power supply and SB-600 speaker. All with manuals and in perfect physical and operating condition, $300. Will ship or deliver. Willard Revaz W1MBX, 21 Nancy Mae Avenue, Prospect CN 06712. 203-758-5858.

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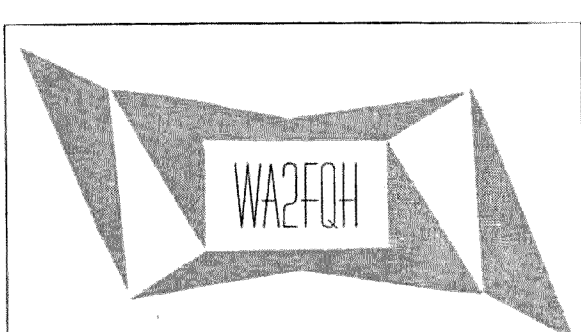
QSL CONTEST



This month's QSL Contest Winner is Lawrence E. Skibicki WA2FQH, of Hollis, New York. His card, called "Homage To An Angle," shows the intrinsially simply beauty of the triangle, thought by many who judge such things to be the most beautiful angle in the world. Though not perfect in degree, you must admit that it does have something.

Enter your card in our contest and win a 1-year subscription to 73. Send all entries to 73 Magazine, Peterborough NH 03458.

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April – 1974

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	$\boxed{2}$	$\boxed{3}$	4	5	6
7	8	9	10	$\boxed{11}$	$\boxed{12}$	13
14	15	$\boxed{16}$	17	18	19	20
$\boxed{21}$	22	23	24	25	$\boxed{26}$	$\boxed{27}$
28	29	$\boxed{30}$				

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	7	7	14	14
ARGENTINA	14A	14	7A	7A	7	7	14	14A	21	21	21	21
AUSTRALIA	14	14	7B	7B	7B	7	7	7	7	7B	14	14
CANAL ZONE	14	14	7A	7	7	7	7	14	14	21	21	21
ENGLAND	7	7	7	7	7	7	14	14	14	14	14	14
HAWAII	14	14	7B	7	7	7	7	7B	14	14	14	14
INDIA	7	7	7B	7B	7B	7B	7B	14	14	14	7	7
JAPAN	14	14B	7B	7B	7	7	7	7	7	7	7	14
MEXICO	14	14	7	7	7	7	7	14	14	14	14	14
PHILIPPINES	14	14B	7B	7B	7B	7B	7	7	7	7B	14B	14
PUERTO RICO	14	7	7	7	7	7	7A	14	14	14	14	14
SOUTH AFRICA	14	7	7	7	7B	14	14	14	21	21	14	14
U. S. S. R.	7	7	7	7	7	7	14	14	14	14	7A	7
WEST COAST	14	14	7	7	7	7	7	14	14	14	14	14

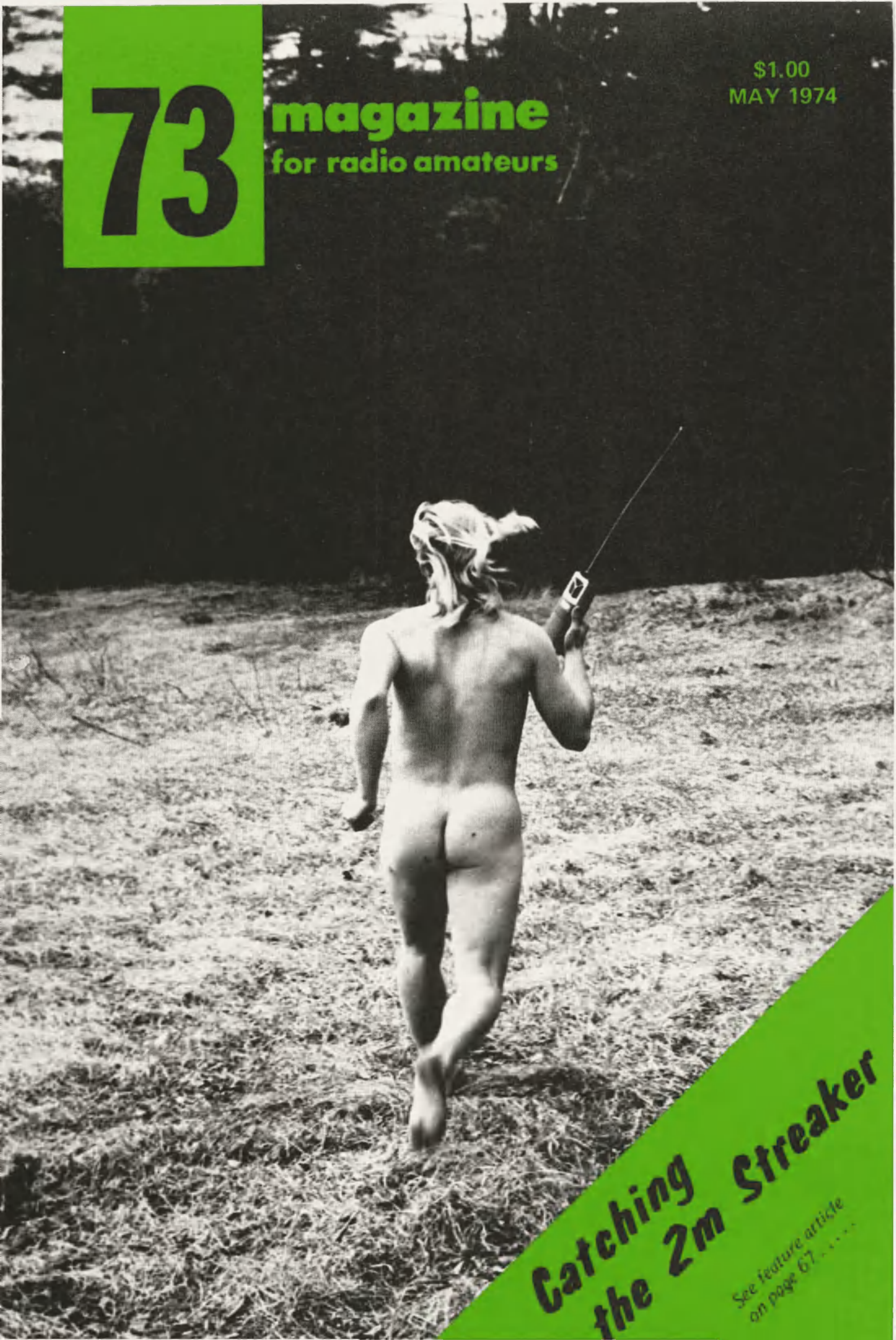
CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7	7A	14	14
ARGENTINA	14A	14	14	7A	7	7	7A	14	14	21	21	21
AUSTRALIA	14A	14A	14	7B	7B	7	7	7	7	7B	14	14A
CANAL ZONE	14A	14	7A	7	7	7	14	14	14	21	21	21
ENGLAND	7	7	7	7	7	7	7	14B	14	14	14	14
HAWAII	14A	14	14	7	7	7	7	7	14	14	14	14A
INDIA	14	14	7B	7B	7B	7B	7B	7B	7	7	7A	7A
JAPAN	14	14	14B	7B	7	7	7	7	7	7	14	14
MEXICO	14	7A	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	7	7	7B	7B	14
PUERTO RICO	14	14	7	7	7	7	7A	14	14	14	14	14A
SOUTH AFRICA	14	7B	7	7	7B	7B	14	14	14	14	14	14
U. S. S. R.	7	7	7	7	7	7	7	7A	14	14	7A	7

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7	7	14	14
ARGENTINA	21	14	14	7A	7	7	7	14	14	21	21	21
AUSTRALIA	21	21A	21	14	14	14	7	7	7	7	14	21
CANAL ZONE	14A	14	7A	7	7	7	7	14	14	14	21	21
ENGLAND	7	7	7	7	7	7	7	7	7B	14	14	14
HAWAII	21	21	14	14	14	14	7	7	14	14	14	21
INDIA	14	14	14	7B	7B	7B	7B	7B	7	7	7	7
JAPAN	14	14	14	7	7	7	7	7	7	7	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7	7	7	7	14B	14
PUERTO RICO	14	14	7	7	7	7	7	14	14	14	14	14A
SOUTH AFRICA	14	7B	7	7	7B	7B	7B	14B	14	14	14	14
U. S. S. R.	7	7	7	7	7	7	7	7	7A	7A	7	7
EAST COAST	14	14	7	7	7	7	7	14	14	14	14	14

A = Next higher frequency may be useful also.
B = Difficult circuit this period.


73
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for radio amateurs
$1.00
MAY 1974
Catching the 2m Streaker
See feature article on page 67 . . . .

73 magazine
for radio amateurs

#164 MAY 1974

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CONTENTS

COVER: In keeping with the times and the theme of this issue, *73* went out in search of a mobile streaker. And while peaking through some bushes we happened across Flash Walker frolicking in the sun. Flash proves that ham radio can be entertaining as well as fun.

73 Magazine is published monthly by 73, Inc., Peterborough, New Hampshire 03458. Subscription rates are $7 for one year in North America and U.S. Zip Code areas overseas, $8 per year elsewhere. Two years $12 and $13 overseas. Three years, $15, and $16 overseas. Second class postage paid at Peterborough, New Hampshire 03458. Phone: During office hours 603-924-3873, other times there is a tape recorder for messages on 603-924-3883. Microfilm edition of 73 available from University Microfilms, Ann Arbor MI 48106. Magnetic tapes available from Science for the Blind, 332 Rock Hill Rd., Bala Cynwyd PA 19904.

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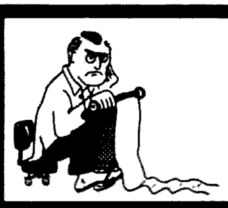


NEVER SAY DIE

. . . de W2NSD/1

EDITORIAL BY WAYNE GREEN

MORE IRS?

The letters keep pouring in from readers with horror stories of the IRS and newspaper clippings of further IRS sponsored disasters. There are occasional stories where there has been some sign of there being nice people working in the IRS, but the instances of callous disregard for the rights of taxpayers are overwhelming.

One reader referenced a new book which documents the blundering which apparently has resulted in the State of Ohio not actually being made an official state of the U.S. This happened back in 1803, I gather, and there was a frantic and relatively secret attempt to cover this up with a retroactive joining of the Union in 1953. The author gleefully points out that the 16th amendment to the constitution (the income tax) was passed by only the bare minimum of states. . .and one of these was Ohio. . .so if Ohio was not legally a state at the time, then the 16th amendment was not passed and there is no legal income tax. If it turns out that Ohio is not really part of the Union. The IRS has a lot of tax money to give back.

PROBLEMS . . . .

There are some other problems with that 16th amendment too; the main ones being that a good many of the parts of the IRS code appear to be clearly unconstitutional. The only way the courts have been able to cope with this is for the judges to instruct the juries that they are to totally ignore the constitution and bring in their verdicts solely upon the law as it is presented to them by the judge. Last December Jim Scott finally managed to get a hearing before a jury on his blank IRS tax forms in order to try and test the constitutionality of the IRS rules. Judge Crocker in Fresno instructed the jury, "The court (the judge) in this case rules that the IRS codes and laws used in this case are constitutional. The 16th amendment is constitutional and is the law. It does not violate either the 4th or 5th amendment. The jury is not to be concerned with the law itself nor the wisdom of the court in determining the law." It's things like this that make a lot of people boiling mad. Is it possible that any question of law based upon the constitution does not have to go all the way to the Supreme Court for a decision?

LETTERS

Fear pervades all of the correspondence I get about the IRS. Many readers give no name or call. . .and all the others ask not to be revealed. In view of the record of vindictiveness of the IRS this fear is well founded. Governor Lee of Utah testified at the Scott trial about a man who committed suicide, stating in a note that he could not continue to put up with the IRS harassment. And before the man was buried his daughter received a note from the IRS demanding all of his records. His 17-year old son, who had worked his first year and had a $400 tax refund coming, received a notice that this money had been applied to his father's account, even though the IRS had as yet no records from which to determine if the father did owe any taxes. Governor Lee turned this information over to the Justice Department and was told by them that only the IRS can investigate the IRS!

In 1955 Governor Lee withheld $100 from his taxes and informed the Secretary of the Treasury Humphrey that he was doing this so he could use it as a way to appeal all the way to the Supreme Court the use of his taxes for foreign aid, which he considered unconstitutional. The IRS attached all of his property. Then they seized the $100 from the separate account where Lee had deposited it. . .seized it without a court order. . .and later released his property. . .all without any court action of any kind.

Lee claimed that he had been shaken down by the IRS every single year since 1934, complete with yearly audits and even though he didn't owe them anything it was cheaper to pay up than try to fight it out.

TAXES – AGAIN

Since we see only the tip of the tax iceberg, it is easy for us not to think much about the enormity of the situation. The fact is that we are paying an incredible amount of taxes, but the withdrawal from our pockets is so slick that, though we are uncomfortable about it, we don't see it happening, and our resistance is kept below the revolt level.

Since we realize, on some level, that the situation may not be acceptable, I suspect that many of us react by avoiding the subject. It's like death, we just don't even want to think about it. Death and taxes, the saying goes, are unavoidable. And, like rape, when something is unavoidable, why not try and enjoy it?

Well, death can be put off by good medical help. . .and taxes can be, similarly, cut to a minimum, even though they can't be eliminated. We don't hasten death just because we know it is inevitable. . .neither should we pay a lot more taxes than we really have to just because some must be paid.

Okay – we can make do with a minimum of taxes – but how do we go about achieving this goal? Could we ever get taxes down to that biblical tythe – the ten percent level? Perhaps, if we worked on all aspects of taxes, we could do just that – or even better.

So what do we mean by taxes and what ways can we cut them down? There are two obvious approaches to this situation – one is to cut down the need for tax money by cutting back on government expenses – and the other is to apportion the tax bite more evenly on the people so that some groups are not taxed heavily while others have little or no tax to pay.

Over 50% of your income is going out for taxes in one way or another – federal and state income taxes – social security taxes – unemployment taxes – gasoline taxes – liquor taxes – tobacco taxes – travel taxes – airport taxes – sales taxes – rooms and meals taxes – occupancy taxes – property taxes – business taxes – telephone taxes – import duty taxes on all imports – sewer tax – road improvement taxes – ICC truck taxes – water tax – car registration tax – drivers license tax – ham license tax – school tax – transfer taxes – stock taxes – ad nauseum. Add the extra cost on every product you buy of the corporation taxes – gross receipts taxes – state and federal corporation income taxes – money spent on employee employment taxes – on federally required insurance (tax) – plus virtually all of the above listed taxes. And don't forget estate taxes, inheritance taxes, gift taxes, probate taxes, and things like that. The government won't.

If the tax bite were equalled a bit, even without trying to save any money that is being wasted on our bureauocracy, with the corporations and businesses made to carry a more significant part of the burden – and with the rich at least equally taxed – we would have a lot more to show for the amount of time we devote to

bringing home that paychecklette. Unfortunately our great government — our democracy — has somehow worked out to represent the wealthy people and corporations rather than the common people. Well, that's not surprising, since it is the wealthy people and corporations that enable our law makers to get elected. They pay the money it takes to con us into voting for their proteges.

Can something be done? Of course it can! But it won't be done if you and I sit there and try not to think about the problem — if we try to ignore it. That treatment does not get rid of problems, it just aggravates them. A couple of hundred years ago our forefathers got pretty upset over the tax situation and they did something about it. They complained about taxation without representation — and we don't have much different today. Sure, when it comes down to it, you appear to have representation. But your representative has been put in his job by money — and it wasn't your money — so when you ask him to buck the buck that keeps him working, what chance do you have? And how real is that representation you think you have?

The Watergate affair brought out the importance of some legislation being put through to try and bring political campaign contributions out into the light and see that they come from the voters and not just wealthy people and corporations who need to have political clout to keep down their taxes or get government favors. If we keep silent about this, we deserve every taxed dollar the government bleeds from us.

ARE WE HELPLESS?

Ralph Nader has shown that the average citizen *can* fight back against the might of U.S. industry — against the conspiracy of the wealthy elite — and even against the government itself. They have the power of money — but we have the power of votes, if only we can organize ourselves to resist having our vote bought via radio, television and newspapers by those who can afford to pay for promotion in these media.

Amateurs demonstrated very clearly that they were not helpless against the FCC, even when the FCC tried hard to ignore the damage they were doing to amateur radio. Amateurs, through their congressmen, put on the pressure and it was felt. We were able to not only get a hearing before the Commission — a historic event in itself — we were able to get immediate changes and the promise of even more changes!

We are not helpless.

It is true that it is difficult for any one person to make a dent in the IRS or in any government behemoth like this — and it is just as true that working together and cooperating we can make the changes we believe are needed. One person can help a group to form and act together — in that way one person can move the mountain.

SHOULD WE FIGHT THE IRS

Though the IRS is by no means the entire problem, it is the crux of it, for if taxpayers go on a tax revolt as our predecessors did two hundred years ago, there is no question but that Congress will notice this and respond to the mandate. In this we have a lot going in our favor. The mail I have received regarding my battle against the IRS has been almost totally in support — give the bastards hell, is the gist of most letters. I don't think many people in America like the way the IRS is doing their job and they don't like the way dollars are being taken from their pockets for ridiculous government programs, foreign aid, wars, arming other countries, etc.

Most of the dealings with the IRS are relatively trouble-free. The IRS is able to collect 97% of the revenue without difficulty and this function costs us about $250 million and the services of about 23,000 IRS employees, who work in the IRS offices and computer centers. Then we come to that other 3% of the collections. . .and here we find that the IRS spends nearly S1 billion and uses nearly 50,000 employees. Would you run a business like that? The Audit-Compliance section of the IRS is almost totally wrapped in secrecy, with little information even available to Congress. In fact, the Senate Appropriations Committee has a Sub-Committee for the Treasury which has only one member who is responsible for reviewing this billion dollar budget! It is obviously impossible for one man to cope with a budget of that magnitude.

In order to collect the taxes involved the IRS has constantly demanded more and more power — and been granted it. Many people now feel, in view of the wide range of excesses of IRS agents, that too much power has been given or permitted, that it is high time to review the whole collection enforcement process.

WHERE TO START

One of the worst aspects of IRS power is its use of the Federal Grand Jury for its own purposes, with virtually no restraint. Any unrestrained power will most surely be abused, and this one certainly is.

The way the system works right now an IRS special agent can go before a Grand Jury and testify against a taxpayer, saying whatever he wants, with absolutely no fear of any consequences, no matter how barefaced the lies. No record is kept of the hearing — none whatever — so there is no evidence against the agent and his perjury. On the basis of this one-sided testimony the Grand Jury hands down an indictment of the taxpayer. And, on the basis of that indictment, from then on the taxpayer is in deep trouble.

An indictment immediately cuts off all credit for the taxpayer. In fact, his creditors may use this as an excuse for demanding quick payment of debts. You can imagine what this does to his life and, if he has one, his business. It even makes it extremely difficult to get the legal and accounting help he is going to need to fight the case. In many, if not most, cases it is impossible. And without expert help — really expert — he is sunk. This is why the IRS has such an impressive record of winning these cases.

Is there any simple solution to this ghastly situation? Well, for starters, it would help the Grand Jury if they had some way of getting some information which would make it possible for them to hand down a more unbiased decision. If they could have an opportunity to ask a representative of the taxpayer some questions, they might be able to get some light on the situation, and be less in the dark. If such a thing had happened in my own case I am certain that no indictment could have been handed down and 73 would have been saved tens of thousands of dollars. Such a procedure could save many, many small businesses, and even lives. There is no known argument against it, except by the IRS.

This one simple safeguard would take a lot of the power out of the hands of the IRS special agents. If they knew that they might get in trouble if they lied, it could help to keep them more honest and stop the railroading of victims through the courts. It is a fact that the IRS has been used for political reasons to screw enemies of the government — that the IRS is exceedingly vindictive and persecutes critics and others on its "list."

Another safeguard would be to force the IRS to make their secret manuals for agents available to the public as Congress has decreed with the Freedom of Information Act. The IRS has been and remains one of the leading offenders in this regard. A recent test by Freedom Magazine showed that the IRS still has no

Cont. on page 75

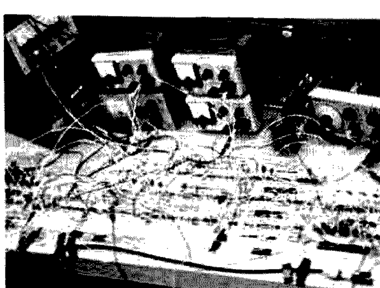
SSTV SCENE

Dave Ingram K4TWJ
Rte. 11, Box 499, Eastwood Vil. 50N
Birmingham AL 35210

Slow to Fast Scan conversion is coming of age, and rather fast. This month's pictures are compliments of Dr. George Steber WB9LVI, and show his converter unit which has been in operation about 9 months(!). The converter includes an MOS shift register memory that can store an entire frame of video. Resolution is 128 bits horizontal by 128 lines vertical with 16 levels of brightness and requires a total of 65,536 bits of storage. Also included is buffer circuitry that allows

Here's the fast scan monitor at WB9LVI, displaying a slow scan picture through the aid of the slow to fast scan converter.

incoming SSTV video to be continuously added to memory and displayed simultaneously. This gives the effect of painting newly received pictures over older ones. Viewing the pictures on an ordinary TV produces large, fliker free, bright pictures and when transmission stops the last frame is retained in memory and displayed continuously. George's scan converter uses a total of 64 – 1024 bit MOS shift register ICs, and considering it takes about 6 transistors to store a single "bit," this gives the equivalent of over 400,000 discrete transistors.



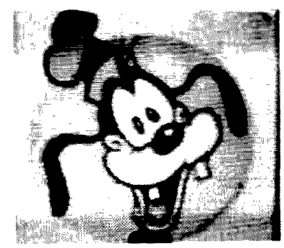
Breadboard of the SSTV slow to fast scan converter.

Recently, while chatting with John WB2AZT, on 20m, he demonstrated the new Venus C-1 micro focus camera which was rather impressive. The camera will focus down to 1/4" through a special vidicon movement assembly thus giving full screen reproductions of small items like ICs and postage stamps, with sharp definition. Also included is a built-in video inverter and bar gerenator. (Flip a switch and either function is initiated immediately.) The camera outputs with either Fast or Slow Scan TV, which is quite handy during camera setups. Incidentally, Venus also now has a vertical retrace modification for their SS-2 monitor, which yields better syncing under noise, so you might check with John if you haven't received any info from Venus.

I received some hard-copy SSTV pictures from Leo K1GRT, recently which were fairly good copy. He had accomplished this "paper readout" by using an acoustical coupler and feeding a SSTV signal into a 3M model 850 FAX machine. (This late model machine responds to audio *frequency* variations, whereas older models like DESKFAX units respond to amplitude variations.) Leo mentions this is an inexpensive hard copy procedure provided one has access to the 3M machines. Also, red, green and blue tracing paper is said to be available for this 3M machine (although Leo has not found any as of this time) and if run through 3 times, should produce fairly good color SSTV hard copies. If ny of you know where K1GRT can cquire (or would like to donate) a tew sheets of this tracing paper he will attempt the above procedure and return a copy to the donator(s).

Some months back, I mentioned Ben K5IRO, was trying to acquire a batch of 3FP7 and 5FP7 crts, plus some yokes and shields. Walter W7LLP/5, of 3448 N.W. 18 St., Oklahoma City OK 73107, now has that stock. So, if you need one for a Slow Scan monitor you might check with him as he is passing them along for his cost only, which is quite low. Walter also mentions the 75m Slow Scanners are dropping down to 3830 kHz to avoid DX and teletype QRM on 3845 kHz, so you might keep this in mind when operating 75m.

Judging from activity on the air during this year's SSTV contest, participation was tremendous. (20m was alive with pictures that weekend!). Franco I1LCF, also reports heavy European activity but, similar to our situation, propagation was poor. As of this writing I have received very few logs, although the ones received have ery good scores. Again, I would like o stress the point that involvement in contests helps promote our mode of communication. Send in those scores, no matter how low! If sponsors see only a small group of *entries*, they soon lose faith and say a mode "hasn't caught on yet." We know Slow Scan is "now," but we, as pioneers, must also attempt to convince others of our fraternity. Stand up and be counted!



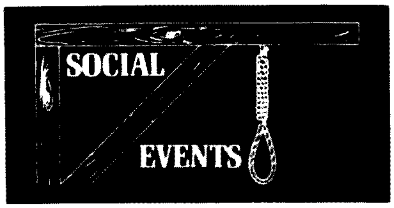
Close up of picture on 10" monitor.

SSTV Terms

Newcomers to SSTV are often confused by some of the terminology used, so this month I have a brief listing of the more commonly used technical terms.

Anode or accelerator – Refers to plate equivalent on crt.
Aperature – Size of "dot" on crt screen.
Aspect Ratio – Ratio of picture width to height. For Slow Scan this is 1:1, indicating a square picture format.
Barrel Distrotion – Picture defect where sides appear to bulge outward.
Composite Video Signal – Entire video signal containing video, blanking, and sync.
Definition or resolution – The amount of fine detail a unit can reproduce. (This is usually dependent on scanning frequencies, number of lines, and size of crt "dot."
Electromagnetic Deflection/Focus – Function produced by magnetic field created by current flowing in *yoke* on crt.
Electrostatic Deflection/Focus – Function produced by voltage applied to *plates* or anode in crt.
Florescence – Brightness of P7s initial trace.
Frame – A complete Slow Scan picture, which takes 8 seconds to produce.
Jiggle or Jitter (in sync) – This is usually a partial loss of sync, causing minute misplacement of various lines of a picture.
Luminescence – Brightness of P7s persistance.
Persistance – Length of time of "afterglow" of P7.
Pincushion Distortion – Picture defect where sides appear to bulge inward. (Pincushioning and barreling are usually caused by improper alignment of yoke to crt).
Raster – The 120 lines (either all white, or modulated with picture information) painted on the crt face.
X-Ray Radiation – IN CRT's caused by applying accelerator high voltage in excess to manufacturers specified maximums.

K4TWJ



SPARC GATHERING

The St. Petersburg Amateur Radio Club will hold its annual Hamfest on Sunday, May 5, 1974, from 9:00AM to 3:00PM at Lake Maggiore, 9th St., So., at 38th Ave., St. Petersburg. Registration will be $1 *per family*. This entitles you to *one* chance on the prize drawing, and use of the swap tables. There will be plenty of nice prizes, and extra tickets for these will be 50¢ each. We will also have prizes for the ladies, and separate tickets for them will be 25¢ each. An extra for the ladies will be a swap table of their own. So gather the family, bring your lunch and come along to meet your friends and have fun.

ERIE HAMFEST

The Erie Amateur Radio Society will hold their semi-annual Amateur Equipment Auction on Sunday Afternoon May 5, at 1PM, at Laborers' Union Hall, 1205 West Perkins Avenue, Sandusky OH. Refreshments, cash prizes, door prizes. Talk-in on 94/94 and 52/52.

MISSOURI SINGLES

The Missouri Single Side Band Net will have their annual picnic at Memorial Park in Jefferson City MO, Sunday June 9. A covered dish dinner will be served at 12:30. Coffee, ice tea and soft drinks will be provided by the net. Door prizes given. All amateurs, their families and friends are invited.

"INDY" 14
(Another Bastille Day Bash)

The Greater Indianapolis Hamfest will be held Sunday, July 14, 1974, rain or shine, at the Marion County Fairgrounds. All activites under roof. $2 covers gate fee and prize drawing. For information write: William J. Evans, 8104 Crest Hill Dr., Indianapolis IN 46256.

MOBILEERS BASH

The Maryland Mobileers ARC Hamfest is June 16, Father's Day, at Anne Arundel Community College, Arnold MD, at 10:00AM – rain or shine. Talk-in on 10/70 and 146.94. Games, refreshments, contests and an auction are planned. Top awards: 2m transceiver and an electronic calculator. Registration $2, tailgating $2. Free parking, but plan car pools to save precious petrol. For futher information contact: Ted Redick K3UPU, 2 Acton Place, Annapolis MD 21401. Telephone: 301-269-5577.

KENTUCKY HAM-O-RAMA

The Northern Kentucky ARC Ham-O-Rama will be held Sunday May 26, 1974 at Boone County Fairgrounds, Burlington KY, from 8AM to 5PM, 10 minutes south of Cincinnati OH on I-75. Features prizes, indoor exhibits, forums, flea market, food. Tickets $1.50 advance, $2 at the door. For tickets and details write: W4PII, 601 Rosemont Ave., Covington KY 41011.

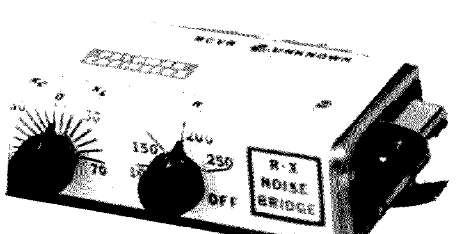
DEKALB COUNTY

The DeKalb County amateurs are sponsoring a Hamfest on May 5, from 7AM to 4PM at Notre Dame High School, 3 miles south of DeKalb off Route 23. Signs will be posted. Registration is $1.50 in advance, $2 at the door. For more information contact: Crawfords Electronics, 301 Main St., Genoa IL 60135.

IRVINGTON HAMFEST

The Irvington Radio Amateur Club will hold it's annual hamfest on Sunday May 19, 1974, 1-6 PM, at the Irvington PAL Building, 285 Union Ave., Irvington NJ. Admission – 50¢ in advance, $1 at the door. Table rental – $2.50. Refreshments will be available. Door prize!! For more information and advance tickets contact WA2PWZ, 9 Barbara St., Newark NJ 07105.

R-X NOISE BRIDGE



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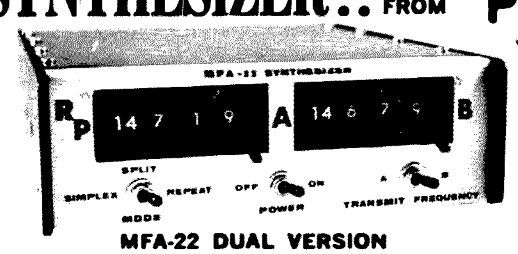
THE NEW DELUXE DIGITAL SYNTHESIZER!! FROM Rp



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Also Available MFA-2 SINGLE VERSION

- **Transmit and Receive Operation: All units have both Simplex and Repeater Modes**
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- **Low Impedance (50 ohm) Outputs: Allow long cable runs for mobiles**
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- **PRICES**

MFA-22	$275.00
MFA-2	$210.00
Shipping	$3.00

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Champaign, IL 61820

SEND FOR FREE DETAILS

ROCKY ARRL FEST

The 1974 ARRL Rocky Mountain Regional Convention will be held June 7, 8, and and 9, at the Ramada Inn in Pueblo CO. Pre-registration fee is $6, at the door $7. Meals, accomodations and camper/trailer hook-ups will be available for the three days of the convention at special reduced rates. Sunday afternoon banquet with speakers from Industry and the Amateur Radio Field. For additional information write: Convention Committee, P. O. Box 92, Pueblo CO 81002.

BIRMINGHAM HAMFEST

The Birmingham Amateur Radio Club proudly announces the 1974 Birminghamfest Convention at the Alabama Fairgrounds Exhibition Hall, Saturday and Sunday, May 4-5, 1974. PRIZES. Talk-in: 3.695 and 34/94.

FLUSHING FESTIVITIES

The Hall of Science Radio Club will hold its annual Fleamarket/Auction/Picnic at the Hall of Science, 111th St. and 48th Ave., Flushing Meadow Park, Queenes, on Saturday, June 8, from 10:00AM to 4:00PM. Fleamarket setup 9:00-10:00AM. Admission $1. Sellers $2. No commission. Free parking. An auction service available with 10% fee. Rain date is Saturday, June 15. Zoo, Childrens' Farm, Golf, Boating, Art Museum, Science Museum, etc., adjacent. For more information call/write: 212-699-9400 or Box 1032, Flushing NY 11352.

P.H.D.

The P.H.D. Amateur Radio Association invites you to attend its Fifth Annual North West Missouri Hamfest in Kansas City MO on Sunday May 5, from 9AM to 4:30PM. The location will be in the Kansas City North Community Center, one mile south of the Antioch Road, Highway I and I-35 Interchange. Address is 3930 No. Antioch Road.

ANGOLA FEST

The Original FM Hamfest, Sunday, August 4, 1974, near Angola IN. Free fleamarket, entertainment for ladies and kids. Picnic grounds, campsites, boating, food, soft drinks, available – rain or shine. For information contact: Fort Wayne Repeater Association, Box 6022, Fort Wayne IN 46806.

TRI-STATE ARS FEST

The Tri-State ARS will hold their annual Hamfest on May 18, 1974, at the 4-H Fairgrounds, U.S. 41, 3 miles north of town. Overnight camping, auction, flea market, door prizes and ladies bingo. For information or advance registration contact: Steve WB9MDB, 5805 Berry Lane, Evansville IN 47710.

YELLOW THUNDER (WHITE LIGHTNING!)

The 4th Annual Yellow Thunder Hamfest will be held at the Dellview Hotel in Lake Delton WI, on May 18, 1974. Events will include a swapshop, meetings of MARS, ARPSC and VHF repeaters with a cocktail hour and banquet in the evening. Registration will begin at noon. For further information contact: Kenneth A. Ebneter K9GSC, 822 Wauona Trail, Portage WI 53901.

WEXAUKEE – YEA!

The Wexaukee Radio Club will be holding its 14th Annual "Swap Shop," on Saturday, May 4, 1974, from 9:00AM 'til 3:00PM, at the Cadillac National Guard Armory in Cadillac MI. Talk-in on 146.94 MHz. Everyone welcome – many good prizes – lunch counter – buy & sell – FREE PARKING.

SEE YA IN MARYLAND

The Potomac Area Hamfest will be held at Westminster MD, on Sunday, May 5, 9:00-5:00. S2 registration covers Flea Market and tailgate sales. Professional food and beverage catering on grounds. Parking for 400 cars. Usual hamfest activities. Talkin on 146.94. Details from K3DUA or W3EVF per Callbook addresses.

MONTREAL '74

The 1974 Montreal Hamfest will be held August 4, at the MacDonald College Farm, Ste Anne de Bellevue. Prizes, giant fleamarket, technical sessions, family fun – $2.50/Adult. For more information contact: VE2RM, Box 201, Pointe Claire-Dorval, Quebec H9R 4N9.

FRIENDLY FESTS

Hamfest! Indiana's friendliest and largest Spring Hamfest. Wabash County ARC's 6th Annual Hamfest, May 19, 1974, 4-H Fairgrounds, rain or shine. Admission still only $1 for advanced tickets ($1.50 at gate). Large flea market, technical sessions, bingo for XYL's, free overnight camping, plenty of parking. Bonus for car-pools (4 or more adults per car). For more information or advanced tickets write: Jerry Clevenger WA9ZHU, Route 4, Wabash IN 46992.

SEE YOU IN DES MOINES

The Des Moines Radio Amateur Association invites you to participate in the Des Moines Hawkeye Hamfest at the Iowa State Fairgrounds in Des Moines, Sunday, June 16, 1974, 8:00 AM to 6:00 PM CDT. Booths available for rental. For further information contact: Alan V. Harris, KØOOD, P.O. Box 88, Des Moines IA 50301.

SRRC HMFST

The SRRC Hamfest will take place June 2, at a new sight – the Bureau County Fairgrounds, Princeton IL (It has formerly been held in Ottawa IL). Easy access Rtes. 80 – 6 – 29 – 34. Advance registration $1.50 before May 20, $2 at the gate. For more information write: G. E. Keith W9QLZ/W9MKS, RFD #1, Box 171, Oglesby IL 61348.

JUST BREEZIN' ALONG

The 20th Annual Breeze Shooter's Hamfest, Western Pennsylvania's largest, will be held on Sunday, May 19, 1974, at White Swan Park (Parkway West, 4 miles East of the Greater Pittsburgh International Airport). No fees and parking is free. Tables are available, as is a large flea market. An amusement park is on the premises for the family's enjoyment. Check-ins will be taken on 29 and 146.94 MHz. Further information is available from George Proudfoot WA3QER, 3472 Ivy Hill Lane, Finleyville PA 15332.

MILWAUKEE FEST
(Bastille Day Celebration)

The South Milwaukee Amateur Radio Club's 4th Annual Southeastern Wisconsin Swapfest will be held Saturday, July 14, 1974 from 7:00AM to 5:00PM, at Shepard Park (American Legion Post 434), 9327 South Shepard Avenue, Oak Creek WI. Parking, picnic area, hot and cold sandwiches and liquid refreshments will be available on the grounds. Admission $1, and includes a "Happy Hour" with free beverages. Prizes will be awarded. Talkin on 146.94. More details available from: So. Milwaukee Amateur Radio Club, S. F. Schreiter W9AKF, 104 Brookdale Dr., South Milwaukee WI 53172.

HUMBOLDT HUMBOLDT

The annual Humboldt ARC Hamfest is Sunday May 19, at Shady Acres City Park, Trenton TN. Flea market, ladies activities and a playground for the children. For information contact Hugh Wardlaw WB4SLI, 2678 Cole Drive, Humboldt TN 38343.

BLUE RIDGE

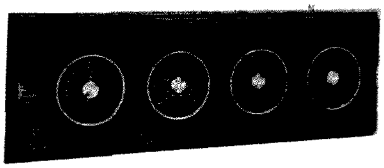
The Blue Ridge Radio Society of Greenville SC will hold its annual Hamfest on May 5, at the Recreation Building in Cleveland Park, Greenville SC. Flea market, prizes, fun from 9AM til 3PM. For information contact Don Rose W4ZKH, 11 Ivanhoe Circle, Greenville SC 29607.

FUN IN KANSAS

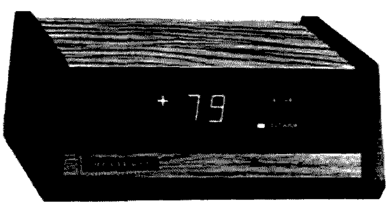
The Central Kansas ARC sponsored Hamfest will be held June 2. For more information contact: Charles R. Svoboda WØLQK, 225 West 9th, Chapman KS 67431.

NEW PRODUCTS

NEW FROM HEATH

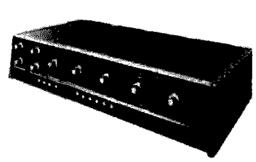


More new products from Heath. The Heath Company, Benton Harbor Michigan is now offering in kit form a professional type weather station for home use. Barometer, lighted wind direction indicator, wind speed gauge and indoor/outdoor thermometer. The new ID-1290 weather station features a solid state thermometer displaying either indoor or outdoor temperatures at the flip of a switch. Sensing devices are mounted on a single horizontal mast that easily attaches to a TV antenna mast or tower. The entire package can be built with conventional hand tools.



Another model for temperature only, indoor and outdoor, is the ID-1390. With 1.27cm numerals, they can be readily seen across a room.

Also new from Heath is the "Ultrasonic Cleaner" in kit form. Excellent for cleaning paint brushes, most jewelry, watches, glasses, dentures, etc. With an automatic timer from 1 to 5 minutes, the unit automatically shuts off. Deep cleans the most intricate items.



A new kit form 4 channel amplifier, loaded with top performance is now available as the model AA-2005, 25 watts, IHF and 15 watts rms per channel, plus built in SQ circuit to reproduce the matrixed 4 channel discs currently available. The AA-2005 is kept simple and uncomplicated through use of modular design.

All these items and more are found in the new Heath Company catalog. . .just check Heath on the reader service form in the back pages of 73.

SCHOTTKY DIODE SPEC SHEET

A power Schottky diode, believed to be the first such device rated for a junction temperature of 125°C and available in production quantities, is described in a spec sheet available from TRW Semiconductors.

The device, designated SD-51, is rated at 60A average forward current with a forward voltage of 0.6V at a junction temperature of 125°C. The unit features a blocking voltage of 200 milliamps at a case temperature of 125°C at 35V. Reverse recovery time in inverter circuits is less than 10 nanoseconds. Packaging is a nickel-plated JEDEC DO-5 case.

SD-51 is ideally suited for computer power supplies and for any application where a diode is used to rectify at 5V.

Further information and a copy of the Spec sheet are available from Sales Manager, TRW Semiconductors, 14520 Aviation Blvd., Lawndale CA 90260. Telephone: 213-679-4561.

SOLID STATE TUNEABLE

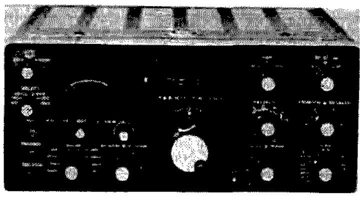
The new ALPHA TT-88 Two Tone Sequential Decoder will respond to any two standard tone codes such as are used in Motorola, General Electric or Bramco type two-tone sequential selective calling decoders and is fully compatible with these systems.

The TT-88 has several exceptional advantages over all other selective calling decoders. It does not use mechanical reeds and is, therefore, far more reliable. It is fully tuneable over the standard frequency range (250 Hz. to 1600 Hz.) It is miniature in size, and has low current drain (9 mA standby) and can, therefore, be utilized in handheld and walkie talkie radio units where space and current drain are critical problems.

With the ease of installation, lack of maintenance, and low cost of the Alpha TT-88 Two-Tone Sequential Decoders, selective calling is now more practical than ever.

For additional information call or write Alpha Electronic Services Inc., 8431 Monroe Avenue, Stanton CA 90680. Telephone: 714-821-4400.

FR-101S 160-2M Receiver



Yaesu Musen innovation and advanced communications technology, now brings you a total coverage, solid-state communications receiver.

The FR-101S has the flexibility that even the most demanding amateur desires-with provision for all mode reception on 21 500 KHz amateur and shortwave bands from 160 thru 2m. This versitile receiver is capable of transceive or external VFO control with the matching FL-101 transmitter-to be introduced soon. New, solid-state technology, with features such as a double-balanced mixer, offer unparalled performance and rejection of cross-modulation and intermodulation interference. Build your "total performance" base station with the addition of the FR-101S communications receiver. List $499.00. For more information contact: Yaesu Musen USA Inc., 7625 E. Rosecrans Ave, Unit 29, Paramount CA 90723. Telephone: 213-633-4007.

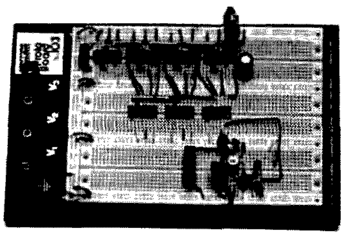
RF TUNING DIODES

A new six-page brochure issued by Amperex Electronic Corporation, contains specifications and application data for variable capacitance tuning, band switching and AFC diodes.

In addition to device specifications, the brochure contains charts of Diode Capacitance vs Reverse Voltage for all 12 types, outline drawings of the five different package configurations available, and a sample schematic diagram of the front end of an FM auto radio showing the use of three of the diode types.

Copies of the brochure may be obtained by writing: Amperex Electronic Corporation, Solid State and Active Devices Division, Slatersville RI 02876. Telephone: 401-762-9000.

SOCKETS AND BUS STRIPS



Continental Specialties Corporation, New Haven CN has developed and is now marketing an expanded line of breadboarding sockets and bus strips with a modular snap-lock capability allowing the user to expand or contract additional sockets or strips as the project requires.

Called Continental Specialties QT Sockets and Bus Strips, these flexible circuit testers accept all discrete multi-pin components without soldering or patch cords. This enables the user to breadboard a circuit almost as fast as he can draw it.

Contacts are encased in a tough, heat resistant valox housing, withstanding temperatures in excess of 100°C. Mounting holes in the housing permit top mounting to any flat surface with 4-40 flat head screws or 6-32F self-tapping screws for behind-the-panel mounting. An insulated backing prevents shorting when mounted on a conducting surface.

Complete technical literature, specifications, drawings and prices are available by contacting Continental Specialties Corporation, 325 East Street, P.O. Box 1942, New Haven CN 06509, 203-624-1811.

NEW FET MULTIMETER

Sencore has introduced a new unit to its All-American made line of multimeters, the FE27 Big Henry FET Multimeter. Big Henry was designed to include protection against the mechanical and electrical hazards of everyday service. The rugged molded acrylic case, backed up by vinyl-clad steel, is virtually indestructible. A spring loaded jewel meter movement has been specially designed to withstand the shock of a ten-foot drop. Internal protection of the sensitive circuitry is provided on all functions by diodes and a fuse. Big Henry will withstand 1000 volts DC across the input on any range.

Big Henry features 1.5% dc accuracy with 15 megohm input impedance, designed to reduce circuit loading and eliminate measurement errors in high impedance circuits. A special ac rms circuit was designed into the unit to read true rms voltage within 3% for either sine waves or square waves produced by regulated power supply transformers in some new TV sets. This circuit provides more accurate rms measurements on other non-sinusoidal waveforms as well. A separate function is provided for ac peak-to-peak measurements for direct comparison readings against peak-to-peak test point voltages labelled on schematics. Price $1.50. For additional information contact: Robert Bowden, Sencore, Inc., 3200 Sencore Drive, Sioux Falls SD 57107.

TUCKER CATALOG

Tucker Electronics Company has announced the availability of a new 160 page instrument catalog. Over 5000 test instruments are listed by nearly 600 manufacturer names including many reconditioned, new and used units. Of particular interest is the availability of an interesting variety of rental and purchase-finance plans. An excellent selection of hand-held and desk top calculators are also listed in one of the 18 distinct sections divided by product category.

Tucker's incoming toll-free WATS telephone system combined with an inventory of over 15,000 instruments provide many excellent bargains. For more information contact: David G. Fletcher, P.O. Box 1050, Garland TX 75040.

RF POWER TRANSISTORS

MRF5174, MRF5175 and MRF5176 are three new RF transistors designed for 28VDC transmitter use. The MRF5174 has 2 watts output and 12 dB gain at 400 MHz, while the MRF 5175 yields 5 watts of output and 11 dB gain at the same frequency. The MRF5176, highest powered of the three devices has 15 watts output at a gain of 10 dB. (All outputs and gains are at 50% efficiency.)

These devices are in Stripline Opposed Emitter (SOE) ceramic stud packages with low inductance dual emitter bonding for high gain high frequency performance in military and industrial applications.

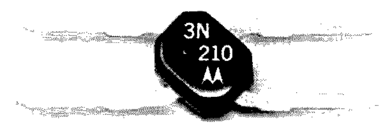
All are characterized from 200 through 600 MHz and for Series Equivalent Impedances to facilitate broadband amplifier design. They are well suited for use as predrivers, and drivers for both transistor and microwave varactor multiplier stages.

For more information contact: Technical Information Center, Motorola Semiconductor Products Inc., P.O. Box 20924, Phoenix AZ 85036.

4-CHANNEL SCAN MODULE

RK Products, 4295 Kentridge, S.E., Grand Rapids MI announces a new RK-4 plug-in, 4 channel scan module, with memorized return from instant priority searchback for the full Regency line, MT-15, MT-120 and Aquaphone Transceivers. Catch all the area action automatically. It will instantly search back to the priority channel every 1-2 seconds, and stays there as long as there is a signal. Otherwise, it instantly returns to the channel it was originally on. A mini-switch can be installed for disabling the searchback feature. Ideal for hams who also want to be sure of getting all the traffic on a particular channel, firemen, policemen, repeater controllers, or to monitor your own private channel. An excellently detailed instruction book and schematic comes with the unit, or may be purchased separate for $1. The RK-4 sells for S24.95, plus 50¢ postage, from RK Products, Grand Rapids, MI 49508.

DUAL GATE MOSFETS FOR 500 MHz APPLICATIONS



Motorola's 3N209 and 3N210 are dual gate, diode protected N channel MOSFETs Silicon nitride passivated for long term stability, these devices are fully characterized in both S and Y parameters.

Developed for use up through the 500 MHz band, they feature designed-in A.G.C. capability, low feedback capacitance, very low intermodulation distortion. Common source power gain at 500 MHz is 13 dB, with a low 4.5 dB noise figure.

For further information contact the Technical Information Center, Motorola, Inc., P.O. Box 20924, Phoenix AZ 85036.

VOICE BAND TELEVISION HARD COPY RECORDER

Alden Electronics & Impulse Recording Equipment Co., Inc., announces the introduction of the ALDEN 400 "Push to Print" Recorder. The 400 "Push to Print" Recorder converts audio VBTV (voice band television) signals into sharply, detailed hard copy facsimile pictures with a frame size of 2.3 diagonal inches.

The recorder records at a frame rate of 8 seconds at 15 sweeps per second on Alfax electrosensitive paper. It receives VBTV transmissions via radio or standard telephone voice grade communications link with no delay in receipt of picture or data. The recorder is complete with synchronous sweep drive, chart drive, internal writing amplifier, power supply and manual framing. A contrast control is incorporated into the recorder to provide the operator with a convenient means of optimizing the recording to provide charity and contrast to suit his needs. Price for the ALDEN 400 "Push to Print" Recorder is S795.00. Delivery is 60-90 days. Write: Alden Electronics and Impulse Recording Equipment Co., Inc., Alden Research Center, Westboro MA.

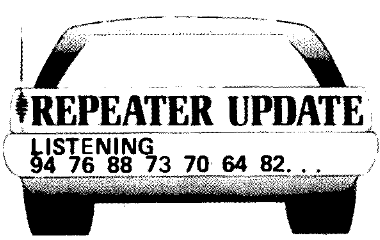
73 REPEATER ATLAS REGISTRATION

REPEATER CALL (WR only)	FORMER CALL	LOCATION (City)	STATE

INPUTS	OUTPUTS	TT Wh TB PL	FM AM RTTY	AUTO PATCH	ERP	
		Hz				USEFUL RANGE (RADIUS)
		Hz				
		Hz				EQUIPMENT
		Hz				☐ SPLIT SITE
		Hz				ANTENNAS & HEIGHT ☐ DIPLEXER

REPEATER GROUP/SPONSOR	TRUSTEE	ID—TYPE OR MFR.

☐ I certify that I have received no outside assistance while completing this form.		
DATE	SOURCE (NAME/CALL)	SPECIAL OR EMERGENCY FUNCTIONS



AR	WR7ACT	Eagle River		6.16-6.76
CA	WR6ADR	Burlingame		7.90-7.30
CA	WR6ADR/6	San Bruno Mt.		7.90-7.30
CA	WR6ACM	Vacaville		6.55-7.57
				52.780-52.525
				449.850-444.850
CT	WR1ABC	Torrington		223.06-224.66
FL	WR4AFL	Jacksonville		6.28-6.88
FL	WR4ABZ	Ft. Walton Beach	T1.8	6.19-6.79
IA	WRØADC	Ottumwa		6.04-6.64
IN	WRØACI	Anderson		6.22-6.82
				6.34-6.76
IN	WR9ACF	Evansville		8.19-6.79
IN	WA9EAU	Ft. Wayne		6.31-6.91
IN	WR9ABN	Ft. Wayne		6.28-6.88
				7.60-7.00
IN	WR9ACJ	Ft. Wayne		CLOSED
IN	WR9ABJ	Gary		7.60-7.00
IN	W9CSF	Michigan City	T1.8	6.37-6.97
IN		Terre Haute		6.34-6.94
KY	WR4AFK	Glasgow		6.34-6.94
LA	WR5AQB	Rayville		6.16-6.76
MD	WR3ALP	Lexington		6.04-6.64
MI	WR8ACP	Jackson		6.28-6.88
MI	WR8ACS	Rochester		6.22-6.82
MI	WR8ACY	Whitmnre Lake		6.07-6.67
				449.00-444.00
MN	WR8ABT	Mankato		6.25-6.85
MO	WRØAOH	Independence		6.13-6.73
NV	WR7ABN	Virginia City		6.16-6.76
NV	WR7ABI	Reno		6.34-6.94
				6.34-7.48
				6.94-7.48
NB	WRØAOF	Clarkson		6.28-6.88
NH	WR1ABQ	Derry		6.25-6.85
				53.580-52.980
				444.25-449.25
NH	WR1ACQ	Saddleback Mt.		6.40-7.00
NJ	WR2ADK	Pleasantville		7.81-7.21
NM	WR5ACX	Albuquerque		6.10-6.70
NY	WR2ADL	Plattsburgh		6.22-6.82
OH	WR8ABC	Cleveland		6.16-6.76
				6.355-6.76
OH	WR8ACR	Cleveland		6.13-6.73
OK	K5CFM	Oklahoma City		6.22-6.82
				7.21-7.81
				52.680-52.525
				449.1-444.1
PA	WR3ACO	Harrisburg		6.22-6.82
TN	WR4AFA	Nashville		6.19-6.79
TX	WR5ACJ	El Paso		6.28-6.88
TX	WR5ABB	Sequin		6.16-6.76
WA	WR7ABO	Olympia		52.525-53.030
WI	WR9ACR	Plymouth		7.84-7.24
Mexico				
	XE1UHF	Mexico City		16-76
Puerto Rico				
	WR4AEC	Adjuntas		6.16-1.76

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

Jim WA3RSP dropped me a QSL to say that he will be on 6m in force from Pittsburgh this summer running a Lafayette transceiver on AM and a Clegg Venus on AM and SSB. Jim is looking forward to lots of Es and scatter contacts.

Larry W3MSN, is active on 6m SSB and CW from Oxon Hill MD with a Swan 250C and four elements. Larry is also active on 2m SSB and CW plus FM on 223.5 and 446.0 and would be happy to contact any and all from the Maryland/Washington D.C. area.

Art WA1EXN, says he has heard from Andy ex-VE1ASJ who is now VO2AB from Goosebay, Labrador. He will be signing VX2AB during 1974, Canada's Centennial year. Andy is looking for an SB-110A and a modified SB-200 linear for 6m operation from the new location. Art has not been personally very active this winter but does mention working WB4NDT on February 17th with 5X9 signals both ways.

Thanks to W3DID for sending a copy of 'The Milliwatt,' the publication of the Baltimore Radio Amateur Television Society. This is a rather short but informative club bulletin.

K5ZMS/5 says San Antonio had an opening to six land on February 1st. Ray worked WB6ECD/6, thereby qualifying another new member for SMIRK, of which Ray is Secretary/Treasurer. Also heard or worked were Lyle K9DKW/7, and WA7UDV, both SMIRK members from Arizona. The evening of the 14th the band opened to the Dallas area during which WA5YCC picked up the con-

Cont. on page 12.

tacts needed for membership. The 23rd the band was open to Virginia, North and South Carolina and Florida. Ray also said that Smirk has 75 members in 15 states with numerous applications being processed and many more expected when the band starts opening again.

The Yaesu FTV-650 transverter available on the American market. This unit, when supplied with power and a little 10m drive will yield 100 watts PEP input on any frequency from 50.0 to 54.0 MHz. While intended for use with the Yaesu line of equipment other types may be used if desired. The manual includes a schematic for a power supply suitable for this purpose. When used with Yaesu equipment power is supplied from the driving unit through cables provided.

This is an all tube design with the triode of a 6AW8 supplying the mixing frequency of 22 or 24 MHz for both receiving and transmitting mixers. The receiving converter consists of a pair of 6CB6s used as rf amplifier and mixer. The pentode half of the 6AW8 is used as the transmitting mixer, the output of which is amplified by a 128Y7 driver and fed to a single 6146 which is pi-net coupled to the antenna. Metering is provided for final cathode current plus input and output relative power. An ALC output is provided. All rf and dc switching is internal. Input and output are 50 to 75Ω, sensitivity is .5uV for 10db S/N (depending upon the receiver with which it is used), image rejection is greater than 50dB. 3V RMS is the required rf drive. The i-f is of course 28-30 MHz. Physical specs are 20.32cmW x 15.88cmH x 29.21cmD (8"W x 6¼"H x 11½"D) with a weight of 14 pounds. The price is currently $159.95, and it sounds good too.

WAØABI

Tom DiBiase WB8KZD
708 6th Avenue
Steubenville OH 43952

Contest Calendar

May 11-13	Georgia QSO Party
May 18-20	Connecticut QSO Party
June 1-2	IARS CHC/FHC/HTH QSO Party
July 27-29	CW County Hunter's Contest

This Month

Georgia QSO Party

From 2000Z May 11 to 0200Z May 13. Stations may be worked once per band/mode. Exchange QSO number, RS/T, and QTH (Georgia county or state, province or country). Georgia to Georgia QSOs permitted. Score 2 points per QSO. Georgia stations multiply total QSO points by total states and provinces worked. DX stations don't count for a multiplier. Non-Georgia use total Georgia counties worked as multiplier. Frequencies are: CW-1810, 3590, 7060, 14060, 21060, 28060; SSB-3900, 3975, 7260, 14290, 21360, 28600; NOVICES-3718, 7125, 21110, 28110. Appropriate awards. Logs should show Date/time in GMT (UTC), stations worked, exchanges sent and received, bands, emission, and multipliers claimed. Check lists will be appreciated. Include signed declaration and brief description of rig and antenna. Entries must be postmarked by June 10, 1974 and sent to CARC, c/o John T. Laney III K4BAI, P.O. Box 421, Columbus, GA 31902. Enclose large SASE for results.

Connecticut QSO Party

From 2100Z May 18 to 0200Z May 20. See March 1974 "73," page 4 for complete details.

WB8KZD

SCHOLARSHIP AVAILABLE

The Foundation for Amateur Radio, Inc., a non-profit organization with its headquarters in Washington DC, announces its intent to award three scholarships for the academic year 1974-75. All amateurs, wherever resident in the U.S. and holding an FCC license of at least general class, can compete for one or more of the awards if they are now enrolled or have been accepted for enrollment in a full time course of studies beyond high school.

Application forms and further information can be requested from the Chairman, Scholarship Committee, 8101 Hampden Lane, Bethesda MD 20014. Requests must be postmarked prior to June 1, 1974.

ARMED FORCES DAY

This year, as in the past, the U.S. Naval Academy Amateur Radio Club will be operating special stations to commemorate the Armed Forces Day Communications Test. In the past this operation has been very succesful, resulting in a great number of hams receiving the colorful QSLs commemorating the occasion.

The test will be on May 18, 1974. Operation will be on 4045, 7385 and 13975.5 kHz on LSB and USB on 20m, using the call NØNNN. In addition, the call WU3SNA will also be used on 3930, 7260 and 14280 SSB, depending on band conditions, of course.

All QSLs should be sent with an SASE to the club in care of W3ADO.

MASSACHUSETTS AMATEUR RADIO WEEK

The amateur radio operators of Massachusetts invite all radio operators to participate in the 6th Annual Massachusetts Amateur Radio Week. A certificate of recognition will be issued to amateurs who take part in the operations award program for the week.

Operating hours are from 0001GMT on June 9, to 2400GMT on June 15. Rules: Massachusetts amateurs must work 16 other Massachusetts amateurs. The rest of the New England State's amateurs must work 8 Massachusetts amateurs. All other amateurs in the U.S. must work 5 Massachusetts amateurs. Any band and mode may be used. All stations participating will exchange signal report, county and state. Logs must show date, time and frequency of contact. The certificates will be endorsed for band and mode only if requested. Applications must be received no later than July 31, and accompanied by a #10 business size SASE. DX enclose one IRC. Submit applications to Bill Holliday WA1EZA, 22 Trudy Terrace, Canton MA 02021.

WB8KZD

Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA 91402

It was in May of '67 that I first visited Los Angeles. I was on a business trip and as always my trusty Twoer was in my luggage. Along about 10PM, after a day of meetings and a good dinner I dug the "lunch-box" out, plugged in the ¼ λ whip and fired up /6 from my hotel room in Santa Monica. Now, that was a strange sounding round-table; everytime one guy stopped talking there was a beep and another station would take the place of the first. More fascinating, everyone seemed to have the same signal strength. I listened for awhile , then skooted down band and made contact with WB6NCF. I asked Bob about that "odd" QSO up band and was told it was the K6MYK repeater. I also learned that a quick

Con t. on page 15.

LETTERS

CHALLENGE THE IRS

Just a note to inform you of some ways to challenge the IRS; I'm not a tax expert by a long shot, but it looks to me like a way to at least pay only the taxes you are required by law(?) to pay. The article was in the March 11, 1974 issue of U.S. News and World Report, pages 70-72. It deals with challenging the IRS on owed taxes up to $1500 in a "small claims" court. The decisions are made by a judge – quite often in favor of the individuals rather than the IRS. The decision is final – it cannot be reversed by *any* court – not even the Supreme Court.

Name Withheld
South Bend IN 46628

AT LAST – A CALL!

I have finally obtained an Amateur Radio License with the call WN2UAU. Now any Novice who reads this letter will say, "That's wonderful. Congratulations!" the Techs will smile and shake your hand, the Generals will smile, the Advancers will just nod their heads and the Extras will just yawn and say, "So what?" Well, that document has taken me, believe it or not, eighteen years to get.

My interest in Amateur Radio started in 1955. The first ham magazine I bought was CQ, December, 1955. I remember that it showed a tower with a 20m beam with Christmas lights strung up the guy wires and I also recall Wayne Green (you know him?) was editor of CQ.

The eighteen year long wait was because of a disasterous disease called laziness. But I finally "mastered" the code and now I have the coveted Novice License. Now I belong to the wonderful fraternity of Amateur Radio. Wheee!

B.F. Alabastro, Esq. WN2UAU
Frankfort NY 13340

XE1VHF

We would like to advise you and your readers of our new 2m repeater now in operation in the Mexico City area. The repeater has been in operation since last August and is the first fully automatic amateur repeater in Mexico.

The repeater is sponsored by our club "Association VHF de la Ciudad de Mexico" (Mexico City VHF Association) and is maintained by dues of our members. Call is XE1VHF and frequency is 16/76. Although the repeater is for use by club members, all visitors are welcome.

There is no formal reciprocity agreement between the U.S. and Mexico, however, visiting hams can contact me at my home address below and perhaps a temporary permit can be arranged. In any event, bring a small rig or a Walkie Talkie as a way can undoubtedly be found for a visitor to use the repeater. Most of the fellows speak English and there is activity on the repeater at all times.

We are planning a second 2m repeater as well as a 450 MHz UHF repeater using the call XE1UHF.

R.N.Green XE1WS/W2GFO
President-VHF Association
Palmas 1460
Mexico City 10, Mexico
Phone: 520-79-93

de WN6DHM

I want to thank you, and 73 Magazine for the role you played in helping me get some help so that I could get my license. I also want to thank Richard H. Klotsche for his help after reading your column "Ham Help." Thank you all.

Gary L. Weseman WN6DHM
San Diego CA 92105

NOVEMBER COVER EXPLAINS IT ALL

In reference to your November '73 cover. I find that it states the amateurs' opinion very well. This may not be to the liking of some amateurs, but you can't please all of the people all of the time. It also seems that the FCC doesn't please anyone at any time. Keep up the good work against the FCC and the IRS.

I have, in recent days, been studying for my General class license. In a part of the regulations – the part about the five principles that express the fundamental purpose of the amateur radio service – it seems there is some conflict between what Mr. Walker has done and what is supposed to be done. One of the five principles is: Encouragement and improvement of the amateur radio service through rules which provide for advancing skills in both the communication and technical phases of the art. Obviously, there has been a misinterpretation of the rules by Mr. Walker. Maybe he did it on purpose?

John W. Zelz Jr., WN1SRQ
Stafford Springs CT 06076

CASSETTE A SUCCESS

After seeing your advertisement and reading your editorial regarding the use of your cassette and tape in learning the Morse Code; and trying to study the code via other means, thought that your cassette and tape would be an easier way of learning.

So, I ordered the cassette and tape and very readily learned the code and passed the test at 5 wpm and then went on to obtain my Technician's license. As a result, I now hold the call of WB9OAJ.

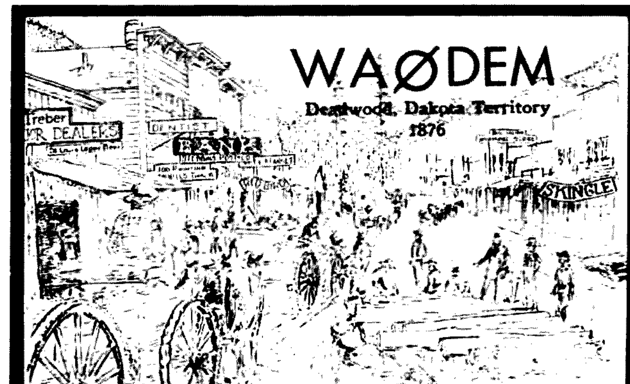
If it had not been for the use of the cassette and tape, I do not believe I would have passed the test the first time around. I highly recommend the cassette and tape for anyone wanting to learn the code rapidly. I also have the tape for 13 wpm which I am now studying and in the near future hope to go for my General Class License.

Ruth Finch
Wauwatosa WI 53226

QSL CONTEST

Our QSL Contest Winner this month is Jene H. Melton WAØDEM, of Deadwood SD. His winning entry is a representation of the Dakota Territory in 1876. At the far right of the card is Ms Martha Jane Canary. And two over from her is one of the last known renderings of James Butler Hickok, done shortly before his death.

You are cordially invited to participate in our QSL Contest and, perhaps, win a 1-year subscription to 73 (and the envy and admiration of all of your friends). Send us your card TODAY. Send your card to 73 Magazine, Peterborough NH 03458.



Caveat Emptor?

Price – $2 per 25 words for non-commercial ads. $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

FREE CRYSTALS with the purchase of any 2 meter FM radio. Write for our deal on the rig of your choice. Factory-authorized dealers for Regency, Drake, Kenwood, Tempo, Genave, Swan, Clegg, Ten-Tec, Standard, Midland, Hallicrafters, Galaxy, Sony, Hy-Gain, CushCraft, Mosley, and Hustler. For the best deal around on HF or VHF gear, see us first or see us last, but see us before you buy. Write or call us today for our low quote and become one of the many happy and satisfied customers of Hoosier Electronics, R.R. 25, Box 403, Terre Haute, IN 47802. (812)-894-2397.

MONTREAL HAMFEST 74, August 4, MacDonald College Farm, Ste Anne de Bellevue. Prizes, Giant fleamarket, Technical sessions, Family fun, $2.50/adult. Info contact VE2RM, Box 201, Pointe Claire-Dorval, Quebec H9R 4N9.

MOTOROLA PORTABLES – Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal Services, 6663 Industrial Loop, Greendale WI 53129.

HAMFEST! Indiana's friendliest and largest Spring Hamfest. Wabash County ARC's 6th Annual Hamfest, May 19, 1974, 4-H Fairgrounds, rain or shine. Admission still only $1 for advanced tickets ($1.50 at gate). Large flea market, technical sessions, bingo for XYL's, free overnight camping, plenty of parking. Bonus for car-pools (4 or more adults per car). For more information or advanced tickets write: Jerry Clevenger WA9ZHU, Route 4, Wabash IN 46992.

NOW PAYING $1750.00 and up for 618T/ARC-102 – $1200.00 and up for ARC-51 – $1500.00 and up for GRC-106, also parts for these sets. D & R Electronics, R.D. 1 Box 56, Milton PA 17847 After 6:00 1-717-742-4604.

EQUIPMENT FROM 73

The following list of gear, unless otherwise noted, consists of brand new equipment purchased for testing purposes only. Some have been tested, some remain unopened in original cartons. We are offering this gear at a considerable discount on a first-come-first-served basis. Please send Money Orders or Certified Checks only to 73 Magazine, Peterborough NH 03458.

MITS 908M Calculator w/p.s. case ($143) new	$ 110
Logiclocks ($120 new) 3/4" numbers 6 figs	$ 75
Heath IB 101 counter ($170) – 5 figs	$ 140
Vanguard Scaler by 10 to 200 MHz ($120)	$ 75
Midland 220 MHz xcvr – brand new – ($220)	$ 180
Clegg 21 220 MHz xcvr new – ($300)	$ 235
Regency 16ch scanner TME H LMU ($300) – new	$ 245
Waller 60A p.s. brand new ($125)	$ 99
SBE Scanvision, complete, like new ($900)	$ 600
Robot Monitor – new – ($296)	$ 240
Robot camera – with micro-focus gear ($330)	$ 250
Pickering CW keyboard KB 1 ($265) – tested	$ 175
Heath HW 202 –brand new – ($180)	$ 165
Heath HA 2022 amplifier new ($70) – built	$ 65
Gladding 8ch scanner – Cheyenne – brand new – ($150)	$ 99
Gladding Hi-Scan – 8ch scanner – tested ($180)	$ 99
Genave GTX 2 – used – ($250)	$ 100
Motorola KW 2m amplifier – used	$ 350
Heath IC-2009 calculator – brand new ($92)	$ 88
SBE-450 xcvr – new – ($450)	$ 299
Standard 1400 2m 22ch xcvr 10w ($550) – used	$ 250
Heath HWA-202-1 power supply – new – built ($30)	$ 25
Signal One CX7 A – tested – perfect – like new – fantastic	$1990
Kenwood Twins – Tested – like new ($900)	$ 750
Standard 146 2m HT – used ($289)	$ 180
Fanon intercom – exec – 6 ch master ($60) tested	$ 35
Genave GTX-200 – used ($270)	$ 100
Icom IC-30 6m xcvr – brand new ($400)	$ 299
Icom IC-60 450 MHz xcvr – brand new ($375)	$ 275
Concord TV camera MTC 15 ch5-6 output tested ($500)	$ 250
Concord video monitor VM-12 tested ($400)	$ 250
Concord all channel TV tuner Dem-911 ($600)	$ 250
Concord VTR – like new – fantastic ($400)	$ 300
Bell & Howell 2966 VTR – like new – excellent ($995)	$ 350
Bell & Howell 2965 portable VTR – new ($1595)	$ 475
Batteries for B&H 2965 – like new ($36)	$ 25
Clegg 6.5A power supply ($80) – brand new	$ 60
Vanguard 2m preamplifier – used – ($25)	$ 15
Vanguard conv 223.34 MHz – brand new – =407 ($55)	$ 45
Tempo CL 220 xcvr – new – ($329)	$ 220
Tempo FMH charger – ACH – brand new – ($30)	$ 20
Caringella Rx – WWV – 5-10-15 MHz – tested ($75)	$ 45
Regency 450 MHz scanner – ($200) like new	$ 140
Varitronics PA-50 2m amp ($110) – brand new – 10w in 50 wout	$ 75
RP tone burst gen – 5 freq – TB-5 – exc ($37.50)	$ 25
Electro-Voice 717 noise cancelling ceramic mike – new ($13)	$ 10
Hitachi cassette recorder – excellent – ($60)	$ 35
Hitachi stereo cassette recorder – exc ($120)	$ 75
Hitachi AM-FM-cassette recorder – exc – ($90)	$ 50
Regency HR 2 xcvr – used	$ 145
Turner mike – noise can NC3500M – brand new	
Vanguard preamp 201 – 52.525 MHz ($25) – new	$ 18
Vanguard preamp 202 – 450 MHz ($29) new	$ 23
Vanguard conv 144-146/14 15 MHz =407 – new – ($50)	$ 40
Vanguard conv 144-146/28-30 MHz =407 ($50) new	$ 40
Vanguard conv =407 146.04/10.7 MHz new ($50)	$ 40
Antenna Spec rubber ducky antennas HM-4 2m	$ 4
KLM 2m amp PA-270B – brand new ($150)	$ 125
SWR meter – exc ($25) KW	$ 12
Test Labs – 10 in 1 – SE-400 ($25) as is	$ 10
Control Signal 10 unit – brand new ($50)	$ 35
Concord stereo recorder-changer – 12 cassettes ($240) brand new	$ 135
VTR Monitor – exc – Hitachi ($225)	$ 125
Video tape – new – per roll ½"	$ 10
Radio Shack Code cassette – new ($6)	$ 4

All prices fob: UPS collect.

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GREATEST of them all! That's the ARRL 1974 National Convention, sponsored by Hudson Amateur Radio Council. Remember the dates – July 19, 20, 21 at the Waldorf-Astoria, New York City. Three days of exciting events!! Wide array of demonstrations, exhibits and forums featuring latest in FM, SSTV, ATV, RTTY, FAX, Satellites, Antenna design, Transistors, Integrated Circuits, DX, MARS, ARPSC and much more. Something to do every exciting minute for YLs & XYLs – Tours, New York sightseeing, visits to popular TV shows, Parties, Fashion Shows. Meet the ARRL President, Vice-presidents, and all 16 Directors! Famous-name Speakers at Saturday Night Banquet! Everything for the Non-Ham, New Ham and Old Timer. For Info, Contact: ARRL Convention, 303 Tenafly Road, Englewood, N.J. 07631.

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JUNE 2 – SRRC Hamfest – new site – Bureau County Fairgrounds, Princeton IL. Formerly held at Ottawa IL. Easy access Rtes. 80 – 180 – 6 – 29 – 34. Advance registration $150 before May 20, $2.00 at the gate. See QST Hamfest calendar or write G.E. Keith W9QLZ/W9MKS, RFD 1 Box 171, Oglesby, IL 61348.

THE ORIGINAL FM Hamfest Sunday August 4, 1974, near Angola, Indiana. Free flea market, entertainment for ladies and kids. Picnic grounds, campsites, boating, food, soft drinks, available, rain or shine. For information contact: Fort Wayne Repeater Assoc. Box 6022, Fort Wayne IN 46806.

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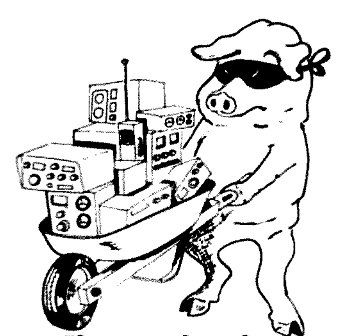

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List from Past Issues:

Mfr., Model, Ser. No.	Owner	Issue
Geneve GTX-200 No. 12-38 (name engraved on cover and Inside of chassis)	W4LRR	5/74
Kenwood TS-520 No. 840092 CW-520/511S filter	W7JFR	5/74
HR-2 No. 04-C2879 SB-34 No. 21 1828	W6GSR	6/73
STD 826 No. 011268	WA2FSD	6/73
HT220 No. GJ7327	State Univ. of NY (Albany)	6/73
Yaesu FT-101 No. 82G 12279/CW HR-2 No. 0302030	W4GF	7/73
Clegg 27B No. 72013-1068	W3BXL	7/73
STD. 826 MA No. 208078	WB2DEW	7/73
Drake ML-2 No. 10582	W3MSN	8/73
Sonar FR-2528 No. 21-4250 STD SRC-851-SH No. 9725 STD SRC-707C No. 2833 TPL PA-6-IDE No. 1092 RP MEA-22 No. 212 Two Larsen antennas	Doherty	12/73
Swan 270 No. M-252616	W4NTB	12/73
STD SRC-146A No. 208070	W7DKB	12/73
Marker Luxury No. 2296	W7BVP/6	2/74
Regency HR-2A 2m FM No. 04-05632	WB8NSU	3/74
Collins Model KWM-2 No. 13551	W9JS	3/74

Looking West

trip to Henry Radio would get me the necessary crystal to make use of this new aspect of amateur radio that I had discovered. Since the next day was to be a free one, I made the voyage to Olympic Blvd., and procured the aforementioned rock. An hour later, back at the hotel I was ready to give this repeater thing a try. I won't bore you with the details, but this was the day that I discovered the fun world of repeaters thanks to a man named Art Gentry W6MEP, and his machine K6MYK.

From what I have come to learn, K6MYK now WR6ABN, is possibly the oldest continual operation repeater in the country. However there have been a number of significant changes since the first time I used it. ABN is now FM, operates on a standard channel of 7.84/7.24 and has just installed a duplexer that really improved coverage. In similar fashion to the Mt. Wilson Repeater Assoc., the Mt. Lee Repeater Assoc., was formed to provide financial support to the repeater while leaving all technical and administrative decisions to the repeater's owner. It seems that the trend toward user support groups is catching on here in Southern California. This is the fourth area group to go this route since the formation of MWRA last year. I like the concept in that it lets a given group of hams who like a particular machine to support it without the formality of a club and without interfering with any policies set forth by the owners of a given machine.

... Cont. from page 12.

ABN is one of those friendly type machines that I personally like to operate. It's also one of the easiest to get your rig on channel for. Art has installed a two-tone system that gives you both tones if you are on channel, or just the respective low or high one in relation to where your transmit rock sits. Just tweek for the dual-tone, but do so only when the machine is not in use. Its a neat system and avoids all those "am I on frequency" breaks.

Both Art and his repeater are still going strong and a lot of us hope they will be around for a long time to come. I have operated many repeaters in all parts of the country, but K6MYK was the first. Needless to say it holds many fond memories for me. Then again, any machine thats been around as long as ABN has to be good. Try it yourself when you are in Los Angeles.

My buddy Dave WB6IRL, called from Stockton the other evening and I got the word of a fairly new 28/88 machine on Mt. Oso. Its coverage is the northern end of the Central Valley primarily into the Stockton area, its call is WR6ACB. Also, Bill WA6NTW, informed me that he and Warren WA6JMM, have their 220 machine (the 34/94 220 machine I spoke of last month) installed at its permanent home some 1800' above the Los Angeles basin. Bill says that not only is its usership growing quite rapidly, but coverage is even better than anticipated.

WA2HVK/6

DX FOOTNOTES

By: Gus M. Browning, W4BPD
Drawer "DX"
Cordova, SC 29039

During the past winter I have been building up and monkeying around with these FB little ICs. And let me tell you "Ole Geezers," if you have not yet tried out these little jewels, you are about to get thrown out of the ball park ! It costs you so little to learn so much and don't ever think you are too old to learn (like I had been for a number of years). In my case I try to "forget" whats inside the IC package, I try to learn "what they will do !", and let me tell you, they can do almost anything except handle real high power. I built up myself a little printed board with two of the 16 pin DIP sockets (the 14 pin DIP will also fit into the 16 pin sockets), and one of the TO-99 (round) IC sockets. Each pin from each socket comes out to a small banana jack & next I built up a good voltage regulated 5V. supply and a zener controlled 9v., 12v., & 15v. supply (all from the same small transf. and rectifiers. The supply also uses banana jacks. Made up a whole batch of short jumper leads with banana plugs on each end. I can connect "anything" to anything. When I have a few spare moments or hours I have a "ball" just "monkeying around" with all kind of IC's and circuits. I am learning a lot about what they will do. I am not interested in "what's inside" them ! You will be "amazed" ole buddy ! With the low cost of these units, wouldn't it be great if "everyone" used them in a synthesizer circuit to control their frequency ? Maybe on cw have the frequencies spaced, lets say, every 200 cycles, and on phone, maybe every 4000 cycles. This is entirely possible right now at a very reasonable price. We could call the various frequencies "channels" and then we could make skeds, have nets, have DX channels listed, etc. All we would have to do is turn a few switches and listen if the DX station is on his "channel", no turning of dials or knobs "hunting" for the DX ! You would soon forget about tuning and just turn switches or tumblers. I don't know about YOU, but, I am having a "ball", learning more then ever, and not spending much loot.

Sure would be nice for those sunspots to get more numerous, and the way it looks right now to me is, it won't be too much longer before this may be coming to pass. It takes those spots you know for those "long openings". Considering all this, there is still plenty of good DX coming through, provided you do a little digging, and be on the air at the right time for the DX.

160 METERS: Best times is for it to be either sunrise or sunset on both ends, or at least on ONE end. This means that IT IS POSSIBLE for DX to be there almost anytime, because the sun is either rising or setting somewhere in the world ALL THE TIME !, Of course it cannot be to far into the daylight hours on either end, otherwise (if you can take the QRN and loran QRM, etc.), you may find DX in there almost anytime during the night, but watch closely plus and minus sunset and sunrise.

75/80 METERS: Plenty of very good DX still on this band and it's rather hard to believe, it can and IS being worked with rather low pwr. It even seems that almost anything works well for your antenna too ! Maybe all this is because the competition is not there like on the higher frequency bands. Such DX as YU, VP1, 6Y5, 8P6, F, YN, 6W8, CO, KG4, M1, YO, HC8, YS, HB9, OZ, HK, HC1, HH2, ZS, G8, ON, CT1, YV, ZL, 9L1, CT2, DL/DK/DM, VP8, LZ, I, TI, CE, VP7, XE, KX5, KV4, HI, FG7, HA, VK, SM, GW, PA, PJ9, GM, UK, UC2, UP2, CR6, OX3, EI, KH6, UW3, CX, and a few more was all heard, most of them worked in about one week of operation, all on 75 or 80 meters, cw amd SSB. This is not bad DX for what is considered as a low frequency band !

40 METERS: We are now beginning to get into what is called, by many, "the DX bands", but to me, working DX on 40 has most always been a rather hard task, especially with all the BC QRM, and other forms of QRM you have to battle. When you consider that all the DX is usually crowded up in just a small handfull of frequencies. I suppose working DX on 40 meters would come a lot easier if there was more space, frequency-wise in which you can really operate. Plenty of good stuff is there if you can take all the various QRM you have.

20 METERS: Now here is what's considered as the DX'ers bread and butter band. (with 15 meters a close second at times). This is where it's all to be found, most of the time. I guess if your DXing time is limited, and if you want to work DX in as short time as possible, this is the band for you. As a rule I have found that at my QTH this band folds up flat about 2 AM and opens up again just a little before sunrise. Then the DX fades out, or at least gets very weak about 9 to 9:30 AM. Opens back up fairly good about 2 PM for Africa, and Europe starts coming through a little later. Of course these hours change a little with the seasons and sunspots. This even seemed to hold true when I was at various spots while I was at many DX spots on DXpeditions a few years ago, EXCEPT when operating near the equator, where the various bands seemed to stay open practically around the clock. So I say 20 meters is the DXers Band, but I warn you this is where the "big-boys" hang out, and if you can stay on the 2nd. layer, you are doing OK !

15 METERS: This is a GOOD DX BAND when it's open, it is a wide band (that's how it seemed to me). The QRM don't seem to be as bad up there, lot less QRN than 20, takes less power to work DX. This band seems to be either open or closed (like 10 in that respect), the DX is there or is not there, none of the half-way stuff like 20. DX at times are spotty, but, just wait until those sunspots get plentiful and this band will crawl with DX. I worked W2QHH when I was at AC3PT on 15, he was only using a ½ wave dipole and about 60 watts ! You do have to be on when the time is right. Those signals get loud when the band is wide open. Don't take a gallon of power and a big antenna to do the trick either. Sometimes when things are "right" this band have been open all night. It's a good band.

10 METERS: This is the "spotty" DX band a good bit of the time, but when it is open to a certain area of the world the signals really "bang" thru, but, you better grab them when they peak, because they can QSB completely to S-Ø in just a few minutes. Propagation north and south is the last to go out, and seems to get very good right after the band goes out to the rest of the world. Best times for north-south path here is late in the afternoon, the Pacific a bit later, sometimes along with the the JA's. Power don't seem to make a big difference on this band, and QRN is not a problem like some of the lower frequency bands.

One of my friends from Bhutan (A51) came by and visited me. We had a FB "eye-ball" QSO and, maybe one of these days I may be back over there and give out some more QSO's from this last "Shangra-La", just about the most beautiful place I have ever seen. And, the people are the best and most kindest of any I have ever met. Sure would be nice to visit this country again and to be on the other end of real DX, once more !

That's it for this month. Gus

CD IGNITION SYSTEM

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Wilmington MA 01887

There seems to be unlimited possibilities in the application of integrated circuits to various problems throughout applied electronics with further inherent benefits of reliability, miniscule power consumption, easy procurement and low cost. This paper is a case in point where their use yields improvement, simplification and cost reduction of a CD ignition system described previously.[1]

A major design problem in capacitor discharge ignition is the dc/dc converter which supplies HV B+. It must have the greatest possible efficiency, low internal impedance and yet be able to sustain a periodically shorted output without distress. The common self-oscillating type is generally employed; it does a good job but requires considerable care in transformer design optimization of feedback and biasing to ensure good transistor switching performance and perhaps some empirical adjustments to obtain a desired frequency Taking a cue from the old days of radio where simple CW keyed oscillators delivering power to an antenna were much improved by going to M.O.P.A. (Master Oscillator Power Amplifier), we also find a number of advantages to this method of power generation when applied to the converter problem. Circuitry evolved which consists of a 50% duty cycle multivibrator that determines frequency independent of transformer characteristics and loading, power transistors are switched op-

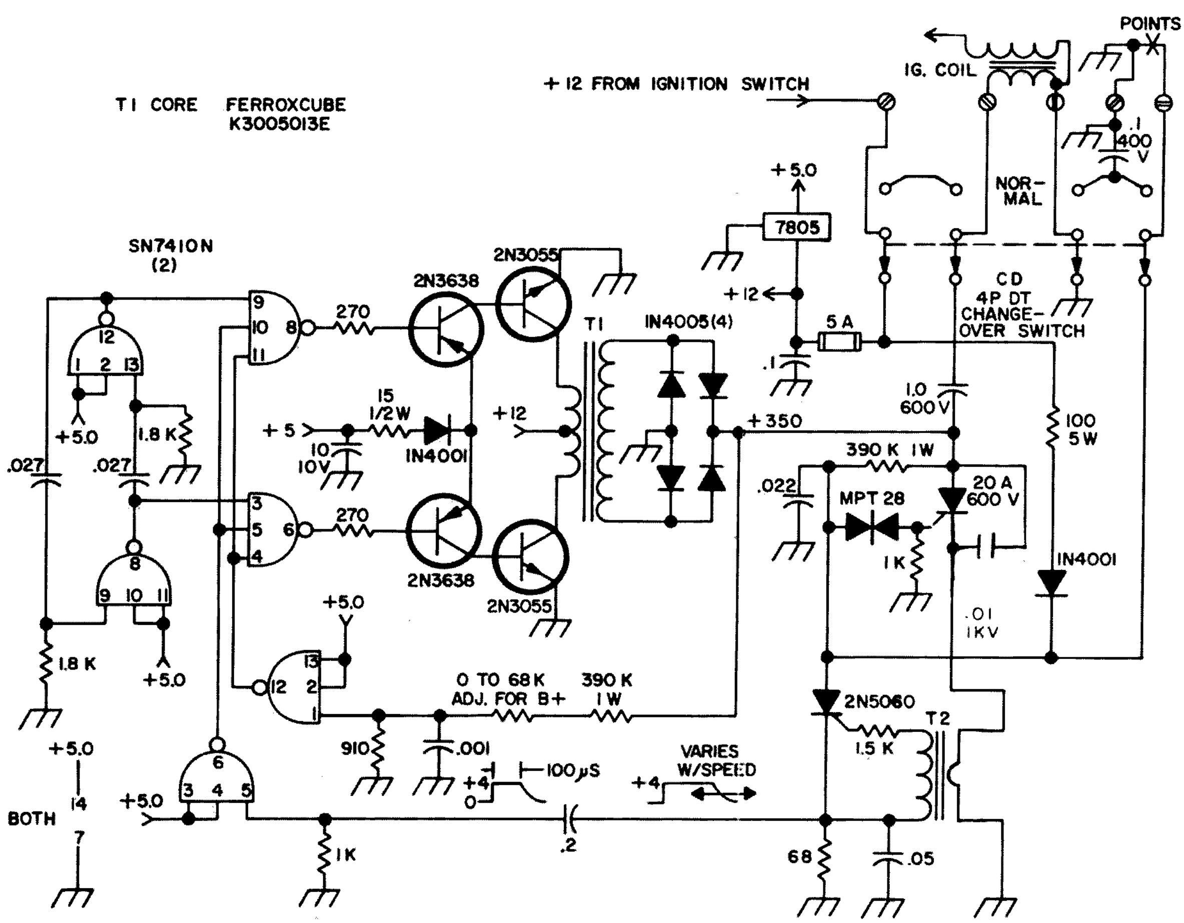

Fig. 1. The IC CD Ignition system. See text for details of T1 and T2.

timally for high efficiency, oscillator drive to the power amplifier is easily gated off in response to a shorted output condition and HV B+ can be regulated at a chosen value by selection of a resistor. TTL logic devices are the magical "Black Boxes" that make the task so easy.

Two sections of a triple 3 input NAND gate make up a multivibrator that free-runs at about 10 kHz, this being determined by capacitor values. Another pair of 3 input gates function as a low level push pull driver working into a class B PNP/NPN power amplifier. It is these gates that control the flow of square wave oscillator drive to the power stage, normally permitting signal passage but inhibiting it when either maximum B+ is reached or SCR firing reflects a momentary shorted output. The remaining two gates are used as inverters to obtain proper logic sense for circuit operation. Although this design calls for two 7410 ICs, other types may be used (a 7420 and 7404 for example). Recent appearance of so-called 'Three lead' IC voltage regulators[2] greatly simplified the selection of a low output impedance device capable of providing both 5V logic B+ and 220 mA current pulses required by the PNP drivers. A 15Ω emitter resistor sets this limit current as a compromise between unnecessary power drain and storage capacitor recharge time which is about 1.8 milliseconds at a B+ of 350V. Full spark energy up to 500 Hz is available while good converter efficiency is indicated by low 12V current drain at various spark repetition rates and chassis-mounted heat sinking of the 2N3055 transistors being sufficient for cooling.

The transformers will have to be fabricated but they are quite easy to build. T1 secondary has 15.24 meters of No.26 Formvar insulated wire put on in 6 bank winding sections, insulated with plastic tape. Then, 20 turns of No.14 insulated wire evenly spaced around the core are added and centertapped. T2 was made up using a yellow dot tuning core from a CTC coil form (slug is 5 mm in diameter by 10 mm long) and has a 30 turn secondary of No.36 wire and a 1 turn hookup wire primary. This item can also be made up from an unshielded iron core rf choke of 30 to 100 microhenrys with a couple of turns wound over it. When the main SCR fires, T2 has only to develop an oscillation burst sufficiently energetic for firing of the sensitive gate latching SCR; pulse shape or duration are unimportant.

Storage capacitor energy is "dumped" rapidly into the ignition coil primary by a power SCR but triggering and reset of this hard-working device is not too easy judging by component count required to obtain positive results as shown schematically and discussed in a previous article.[3] This aspect of CDI was also dealt with at some length in the author's first effort. Preliminary tests using an RS flip-flop made up of TTL gates to control SCR firing and reset worked fairly well but not 100% due to spurious pulses upsetting toggling. A small SCR latch is immune to this difficulty once fired and to insure positive reset in the present circuit, anode voltage becomes negative with respect to its cathode for several microseconds at point closure time. Tests in two cars whose sum total of mileage is about three times around the world with this trigger and latch circuit installed has proven its worth. Even though electronic ignition can tolerate a considerable increase in point contact resistance, this is a fallacy because if resistance *has* gone up, the regular Kettering system will be inoperative if switch back from "CD" to "Normal" becomes necessary. Current bleed of fractional ampere through the points appears to be a satisfactory solution.

If you've been thinking about constructing a CD ignition but have hesitated due to cost, this one figures out to about $15 for parts and low cost surplus semi-conductors. It can easily pay for itself in fewer tuneups, improved wintertime starting and a little better gas mileage. If that won't do it, how about being one of the first with a homebrew "CDI with ICs!"

. . .W1KNI

[1] "Improved Low Cost CD Ignition", K.W. Robbins, 73 Magazine, June 1972.

[2] "A New Dimension to Monolithic Voltage Regulators", Chu & Oswald, IEEE Transactions on BC & TV Receivers, May 1972

[3] "Add-on Electronics for Your Car", F. W. Holder, Radio-Electronics, April 1972

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c/o RLC Inc.
30 East 42nd St.
New York NY 10017

ADDING dBs TO THE AUDIO COMPRESSOR

Simple audio compression units can easily improve the apparent effective signal strength of any SSB transmitter by several dB under difficult weak signal conditions. Simple audio compression is not as effective as rf speech clippers as many tests have demonstrated. However, with frequency response shaping and "soft" clipping added to an audio compressor, the latter can be made almost as effective as much more elaborate speech processing methods. This article desribes how various simple accessory circuits can be added to any existing audio compressor which will considerably improve its effectiveness. The circuits which are added all operate at audio frequencies so no complicated construction is required. The cost is minimal when one considers that they can produce several dB more effective signal strength under poor signal conditions. This is especially true when one considers what the cost would be to increase one's signal strength by 3 dB by conventional means. That means doubling transmitter power, a directive antenna array, etc.

Frequency Response Shaping

If one uses any type of compressor/preamp, it operates on the basis that audio levels beyond a certain threshold activate a gain reduction circuit which reduces the gain of some circuit early within the compressor/preamp unit. Input signals below the threshold are amplified fuller and those exceeding the threshold activate the gain reduction circuitry so that the wide variations in input signal levels are compressed into a much smaller range of output signal levels. Although many compressors have a stated frequency response which includes only the 300 to 3,000 Hz range, this restricted frequency response is not shaped sharply before the gain reduction circuitry is reached. The result is that if one uses a wide response microphone, the gain reduction circuitry is often activated by low frequency audio/signals which are not passed anyway by the SSB generation circuits in the transmitter. The result is that the audio compressor's action is partially wasted on responding to audio signals in a range which are later rejected and are not useful for voice intelligibility. The result is at least a partial waste of the compressor's effectiveness.

The rather simple solution to this situation is to frequency shape the audio signal input to the compressor before any audio compression action is started. One often hears about some type of microphone which seems to have a particularly effective response or audio "punch." Using such a microphone before a good compressor often makes several dB difference in signal effectiveness. However, this type of effect can be duplicated using almost any simple type of microphone if a frequency shaping preamplifier is used before any existing audio compressor! A suitable circuit is shown in Fig. 1. A low noise FET preamplifier is used to provide initial gain for a high impedance microphone input (low impedance via a matching transformer). This stage is followed by a low and high rolloff circuit which can provide about a 15 dB boost or rolloff to frequencies centered on approximately 1 kHz and extending both higher and lower than this center frequency. By the adjustment of both potentiometers, one can just about duplicate the sound of any commercially available communications

microphone as it is heard after the audio compressor. It cannot, of course, compensate for the directional pickup characteristic of a microphone which may be of consideration when a location with high background noise is in question. But it can compensate to a very great degree for individual voice characteristics when used with a given microphone and this is the main advantage of using the circuit in conjunction with a given audio compressor. This initial frequency response shaping is useful by itself but particularly worthwhile when combined with "soft" clipping and further frequency response shaping as described next.

Soft Clipping

Soft clipping refers to the type of limiting action that takes place when a sine wave signal is fed into a clipping circuit, such as a diode pair, but where the sine wave is not cut off along a flat line on its positive and negative excursions. Rather, the sine wave is rounded off abruptly and a far less harmonic rich output is produced. "Soft" clipping is not well defined and where a diode provides

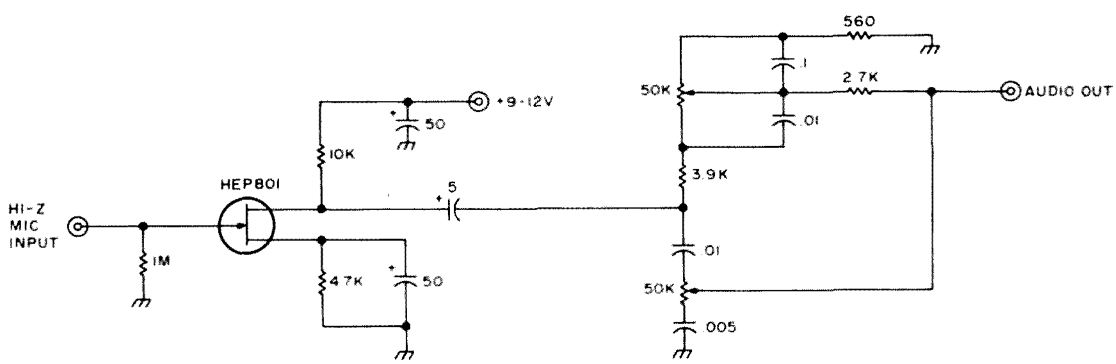

Fig. 1. Shaping circuitry to be added ahead of existing compressor.

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soft clipping by its basic characteristics, it may be regarded as a poor diode for clipping purposes where a very sharp, hard clipping characteristic is desired. Also, one can produce soft clipping by driving a diode pair through some resistance so the diode operates over that portion of its characteristic where it has a rapid current/voltage change characteristic. The diodes operate as a form of a variable resistor element, one diode in the pair responding to positive going voltages and the other to negative excursions.

The latter type of soft clipping is used in the circuit of Fig. 2, which is meant to be placed at the output of an existing compressor. Most compressors provide more than enough output voltage, usually several volts, to drive the clipper circuit. If the compressor has an output level control, it should be set to provide full output for initial adjustment. The clipping can be adjusted by means of the variable resistor in series with the diodes. The clipping itself is not meant to be in action constantly but only as a further adjunct to the basic compressor action. Peaks which the compressor doesn't handle are acted upon by the clipper and the overall average to peak ratio of the processed audio signal is increased *without* significantly more distortion.

The output level of the clipper is very low and it should be followed immediately by a good low noise amplifier. This action, in fact, is one of the most important considerations in making the circuit effective. As shown in Fig. 2, the clipper is followed by a low noise FET voltage amplifier stage which has a broadband, flat frequency response. The voltage gain is sufficient to provide for the loss in the filter in the drain output of the FET stage and still have the final output level more than sufficient to drive the audio input for any transmitter.

The filter following the FET stage is a carefully designed double unit which provides extremely sharp attenuation of frequencies higher than about 3,000 Hz and continues to provide excellent harmonic attenuation up to 30 kHz or more. If one can obtain the inductors (commercial types are available in the correct values), this type of filter is highly recommended because of its excellent harmonic filtering capabilities. Unfortunately, miniature audio chokes of good quality are not very inexpensive, unless obtained from surplus sources. Therefore, Fig. 3, shows an alternate type filter using only one choke which is only slightly less effective. Audio chokes which provide a Q of 60 at least at a few thousand cycles should be used. One side of the audio transformer winding cannot normally substitute for a choke even though it may have the correct inductance. The increased resistance of such windings and other characteristics deliberately engineered to provide a broad frequency response in the transformer result in a very low Q for the windings. A few transistor transformer windings the author measured had Qs of 1 – 2!

Construction and Adjustment

The auxiliary circuitry described is best constructed on perforated board stock and placed in the same enclosure as the audio compressor with which it is used The photo shows the construction used by the author, although there is no need to follow any particular circuit layout. Two commercial type audio chokes are shown being used.

The adjustment process may seem a bit

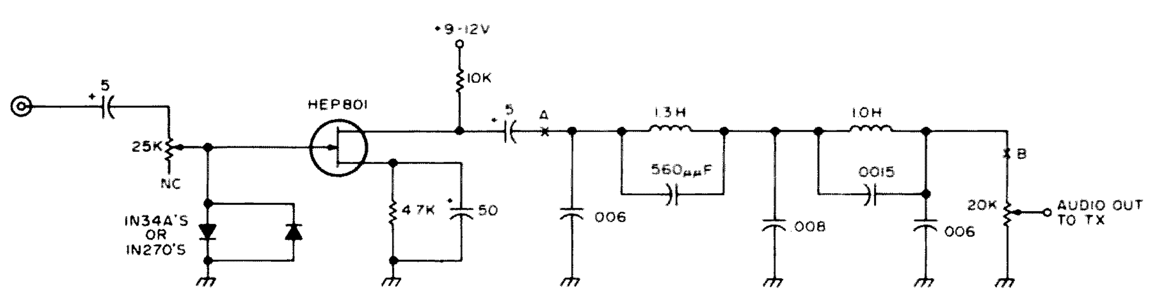


Fig. 2. Clipper and filter for use at output of existing audio compressor.

confusing especially since so many potentiometers are present, including those present in the basic compressor. However, approached step by step the adjustment process is basically simple. Set up the compressor first as it is used normally for best results. Then, connect only the circuitry of Fig. 1 to the input of the compressor. Adjust the rolloff potentiometers in different combinations for the most effective audio sound. This can be done running the compressor output through any good audio amplifier and listening to it over some headphones. However, one can become confused by this method when listening to one's own voice. A far better procedure is to use an over the air check with a local station. The other station should, however, constantly reduce the rf and not the af gain on the station receiver to simulate a barely readable DX signal. One is interested in intelligibility under poor conditions and not fidelity at this point. The audio input level to the compressor (part of the compressor) may also have to be adjusted to prevent over driving the compressor. If problems with rf feedback are encoun-

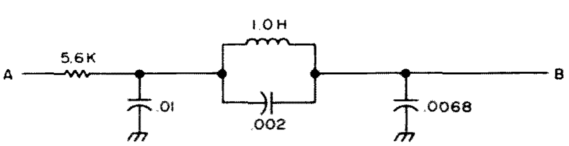
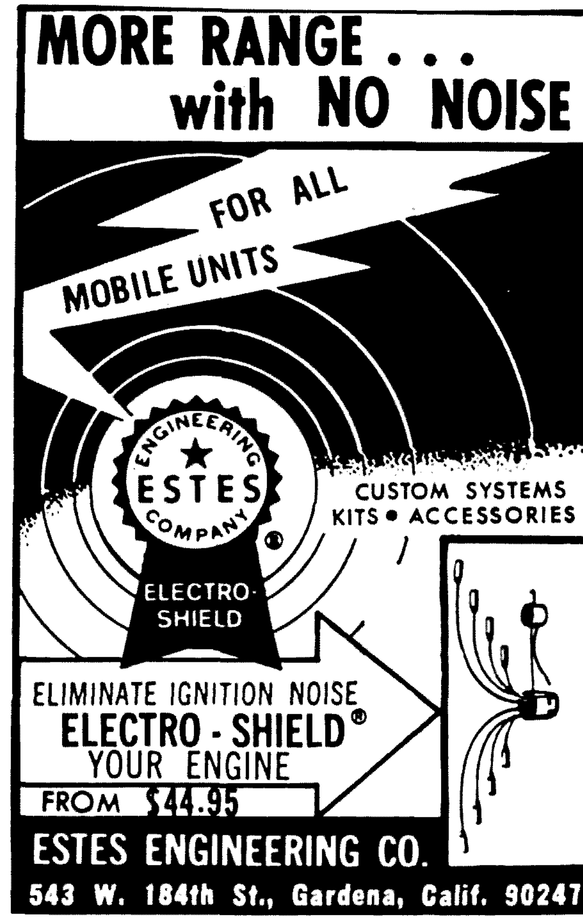


Fig. 3. Alternate filter design to be connected between points A and B in Fig. 2 instead of filter requiring two inductors.

tered, use a rfc of 1 to 2 mH in the input lead from the microphone to the circuitry of Fig. 1.

Then, the circuitry of Fig. 2 with either filter, is connected after the compressor being used. A similar type of adjustment process is gone through by adjusting both the output level control on the compressor, if it has one, and the variable resistor in series with the clipping diodes. The correct adjustment point is a compromise between distortion generated and improvement in audio effectivness. If the compressor is only intended to be used for DX contacts, adjustment should be made under simulated weak signal reception conditions. A final adjustment can be made then by going back to the rolloff potentiometers in the input circuitry



The author tried the auxiliary circuitry described with three different types of conventional solid-state audio compressors. Each unit was meant to be originally complete in itself and have a communications voice frequency response. In each case, greater punch could be obtained under poor reception conditions by adding the auxiliary circuits. The effective gain was estimated at least as several dB. Under strong local conditions, no improvement may be noted, the same as with most audio compressors. In fact, some stations will report the audio distortion as being undesirable but not severe.

When one considers the expense involved in building the accessory circuits described to obtain more effectiveness on DX contacts as opposed to increasing power or antenna gain the circuitry described represents very good value. If the type of equipment you are using works better when a conventional audio compressor is added it will work somewhat better when these accessory circuits are used.

. . .W2EEY

Steve Morgan WA8QNR
101 Cosmos Drive
West Carrollton OH 45449

FINDING A NEW HOME FOR THE MOBILE RIG

Why is it that women do not understand the needs of a man? Man enjoys a cold beer after a hard day at the office. Man enjoys the weekend footabll games on TV, and man enjoys a comfortable home for his mobile rig.

Our 1954 clunker had seen better days and the XYL and I decided to put it to rest in favor of a more modern machine. She had visions of a super car with a nice bench type front seat, plenty of leg room, and a trunk large enough to put half of Sears & Roebuck into it. I agreed with the latter two, but the bench type front seat would have to be replaced with bucket seats – and no console. I didn't want anything in the way that might cause the rig to be cramped. So off we went down to Honest Johns's Chevroford place to get our dream car.

We spent about an hour just looking at price tags. This is a very important step in buying a new home. The price must be low enough so you can still afford to put gas in it after the monthly payment has been met, but it must also be high enough so your wife can tell all of her friends that we just bought a new "X number of dollars" car. So after checking out the prices and playing hide and seek with the salesmen, we decided to start looking at the features that each one in our range had. The first one had enough room under the dash for a good size transceiver, but not enough room for more than one rig. I was planning on running at least the hf bands and two meter FM, so I needed a lot of room. The next one had all the room that I could ever use up front, but you couldn't get a good size watermelon into the trunk. The third one, and last on our list of eligibles, was a perfect compromise between operating room up front and Sears space in the rear. In fact, the trunk was so big I got the idea of putting an amplifier in it.

My wife wasn't too crazy about the bucket seats and the salesman kinda frowned when I asked if I could order it without the console, but they both gave in and we ordered the car. I let my wife choose the color to get her to forget that there would be no console for her to clutter up with her trading stamps and emergency bottles of make-up. When I cleaned out the glove comparment in our '54 trade-in, I found enough stamps to get a new 25-inch color TV console with record player and radio (I didn't tell her that, though, she thinks I bought it for her birthday–actually I spent the money on a new (used) FM rig).

We got the car three weeks ago and my wife is crazy about it. I found that I had miscalculated though – there is enough room under the dash for three rigs, so I am now operating mobile on 80 through 2 meters. That heavy-duty rear bumper that I ordered sure comes in handy for mounting all of those antennas (she didn't know about the bumper and I told her that the factory must have made a mistake). I took the car down yesterday to see about a noise under the hood and had them install factory air conditioning in the trunk to keep the amplifier cool. Don't know what I'll tell the wife when she discovers it, maybe I can tell her that it's an anti-pollution device!

. . .WA8QNR

Billy L. Nielson DL5KS
6587 Baumholder, Germany
Geb. 8006 Apt. 1b

INTERFERENCE SUPPRESSION FOR AMATEUR BOAT OWNERS

Many articles have been written about interference suppression for mobile radio amateurs, but little if anything has been written about using these same principles on marine engines for our many maritime mobile friends. For one thing, there is very little difference in the engine used in a car and the one used in a boat. The main difference is in the method of cooling and shielding for protection against water. It is the aim of this article to provide a few hints and shortcuts to interference suppression for boat owners.

One of the first requirements is patience in locating the trouble area. Next is having or taking the time to correct the problems found. A very useful aid in finding faulty areas is a simple tool made by taking a .5 μF bypass capacitor and attaching a large alligator clip to the metal case and a small alligator clip to the wire lead. Prior to using this aid, one should first perform a few preliminary checks of the ground system used on the boat. Check to ensure the radio, engine, and all attached accessories are making a good, clean electrical ground connection. At the same time, one should also check and clean, if necessary, the battery terminals.

Next, we need to know what can, and often does, cause interference to the radio system. To name a few: the coil, generator or alternator, voltage regulator, tachometer, bilge pump, spark plugs, points, rotor and other electrical instruments.

To begin our corrective measures, start by placing the large alligator clip on the capacitor aid to ground and placing the small alligator clip on the hot terminals of the voltage regulator and generator or alternator. If the interference noise decreases or disappears, you are on the right track.

Next, permanently attach a .5 μF bypass capacitor between the hot terminals of the voltage regulator and generator or alternator. Caution: DO NOT attach a capacitor to the field terminals of the generator or alternator. Attach a .1 μF coaxial capacitor between the positive terminal of the coil and the ignition switch lead. Attach a .005 μF 1000V disc capacitor between the negative terminal of the coil and ground. Illustrations on the proper way to make the above capacitor installations may be found in many mobile handbooks. It would also be helpful to install resistive type spark plugs and spark plug cables if the boat engine does not already have them installed.

If the boat is a used or second hand boat which already has the resistive spark plugs and cables installed, it may be a good idea to replace them with new ones, as the resistive type cables tend to deteriorate from vibration, age and high temperature.

A final step toward a noise-free ignition system would be to ensure that the distributor points and spark plug points are properly gapped, clean and still in good condition. An improperly tuned ignition system can also cause noise.

If this does not completely cure the

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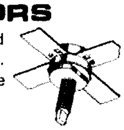

2N5589	3 Watts Out	$ 3.50	2N6080	4 Watts Out	5.00
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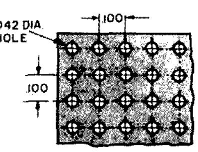

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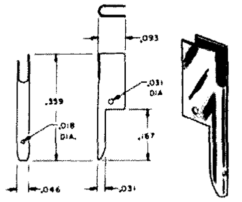
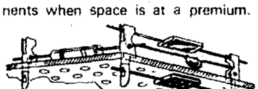
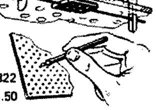
4230	2 x 6	1.09	4239	2 x 6	1.85
4231	4½ x 6	1.55	4240	4½ x 6	3.20
4232	17 x 6	5.75	4241	17 x 6	6.70

PUSH-IN TERMINALS For .042 DIA. HOLES



The terminal is easily press-fit into a .042 dia. hole without staking or the base may be flared for permanent installations. Ideally designed for use in micro-circuitry to support components when space is at a premium.





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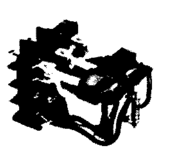

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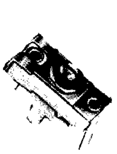
405	1.01	425	.85	462	.52	468	1.20
406	1.04	426	1.01	463	.64	469	1.22
420	.58	427	1.12				



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interference problem, it is necessary to check the accessory items which have brush type motors. These can normally be suppressed by installing a .25 μF pigtail capacitor across the brushes. Make sure the capacitors are capable of handling both the voltage and current present. The same capacitor as above may also be wired across the terminals of the instruments to eliminate any noise caused by the instrument itself (but not on tachometers).

If you have an engine that has the capacitor-discharge type ignition system which is used on most outboard type motors, the methods outlined here will help; however the problem of space may post a slight installation problem. Some of the outboard motor manufacturers offer suppression kits for their products, but there is no guarantee they will be 100% effective.

Some additional steps that may help are: check for good electrical connections, check to see if any of the non-ignition wires are routed alongside of ignition wires, use a shielded ignition system for the distributor-spark plug portion of the system and check the condition of the ignition switch and associated wiring. Dirty contacts in the ignition switch itself can also cause noise. Switch contacts can be cleaned by use of a good contact cleaner which is available at most electronic parts houses.

The following symptoms may help to isolate the interference problem. A popping type noise indicates ignition interference. A steady high-pitched whine which increases with engine speed is caused by the generator or alternator. A ragged, rasping type of noise which is usually found along with the high-pitched whine is indicative of voltage regulator noise. Instrument noise consists of irregular crackling or hissing noises and can be checked by jarring the instruments one at a time.

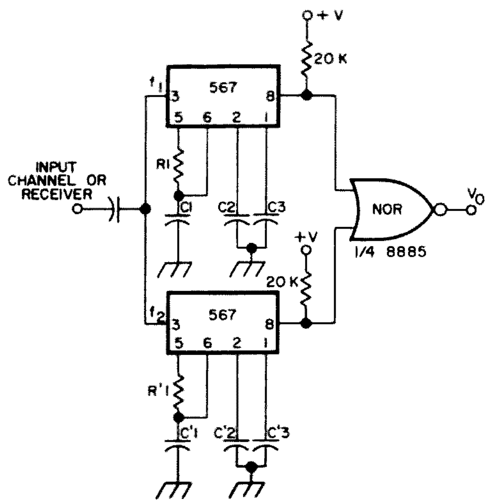
As a final extreme measure, it may be necessary to completely enclose the engine compartment in a copper screen cage. It sounds far out, but can be done if one has both the time and patience to have a completely noise-free system. Here's hoping no one will have to go that far . . . happy ham-boating to our /MM friends.

. . .DL5KS

CIRCUITS

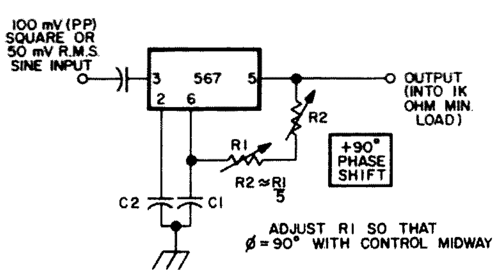
Courtesy of Signetics Catalogue.

DUAL-TONE DECODER



Resistor and capacitor values chosen for desired frequencies and bandwidth. If C_3 is made large so as to delay turn-on of the top 567, decoding of sequential (f_1, f_2) tones is possible.

0° TO 180° PHASE SHIFTER



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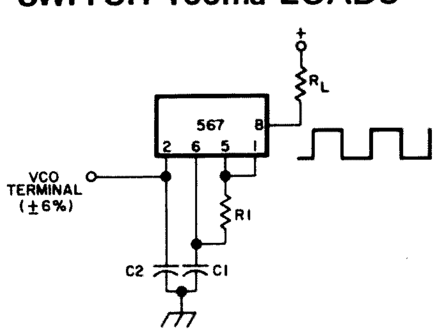
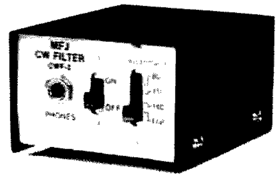
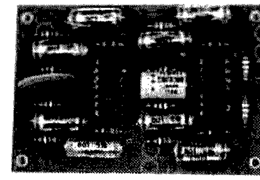


CW FILTER





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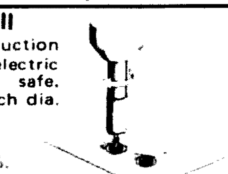

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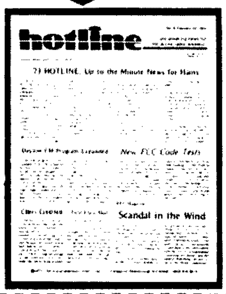

The premier issue of the 73 HOTLINE, which will be published every other Friday, is scheduled for April 5th. This newsletter will cover all the up-to-the-minute happenings in amateur radio . . . FCC news . . . new petitions filed . . . new actions . . . DXpeditions . . . new products . . . propagation flashes . . Hotline Classified ads . . . job opportunities in the ham field . . . hamfest and convention news . . . contest news . . . all those things hams want right now and not the usual two months late magazine schedule. The 73 HOTLINE will be chock full of last minute news since it will be in the mail just a few hours after deadline closing.

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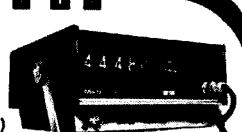

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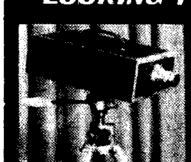

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CIRCUITS...

Courtesy of Signetics Catalogue.

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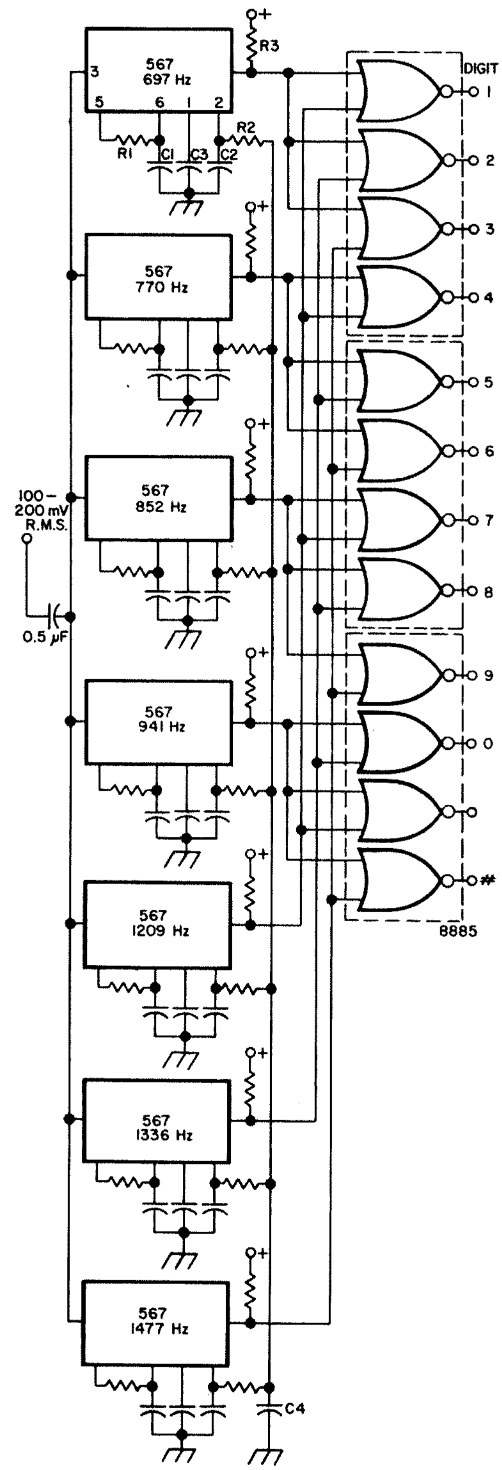

Component values (typical) R1 6.8 to 15K ohm, R2 4.7K ohm, R3 20K ohm, C1 0.10 mfd, C2 1.0 mfd 6V, C3 2.2mfd 6V, C4 250 6V.

CIRCUITS. . .

Courtesy of Signetics Catalogue.

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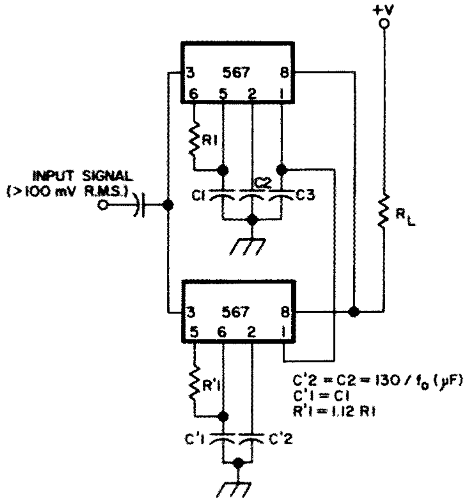

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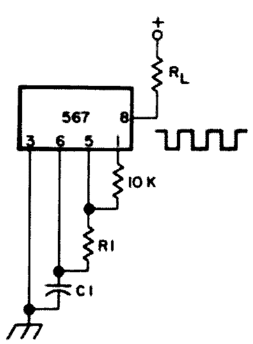

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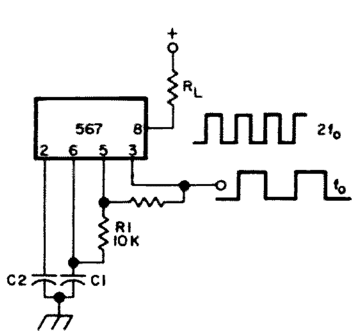

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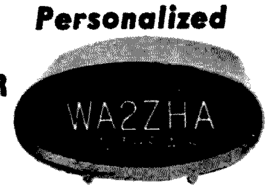

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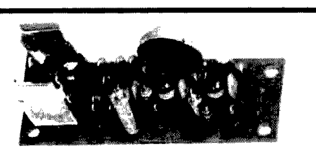

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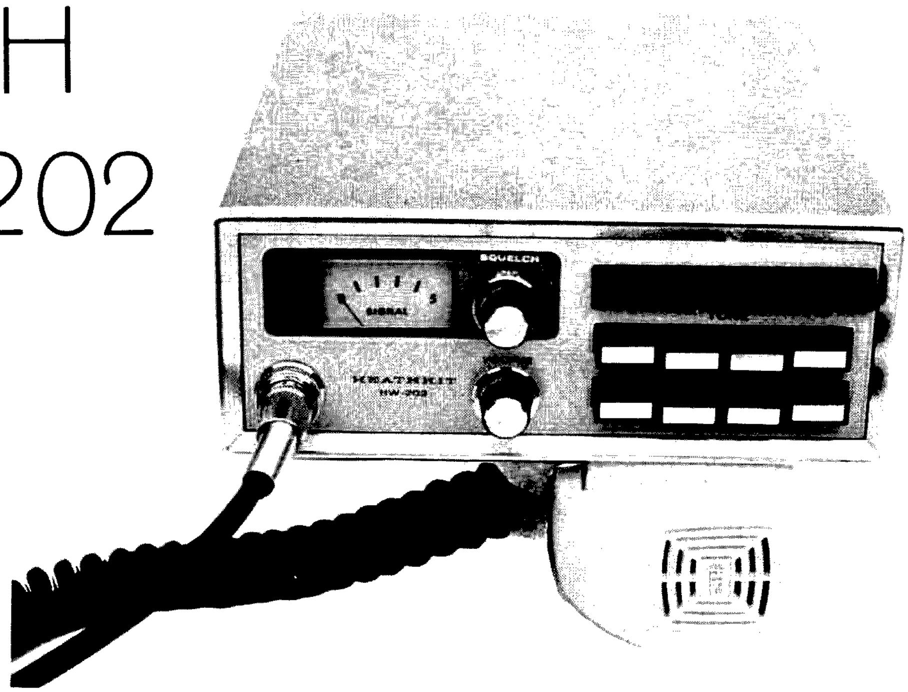
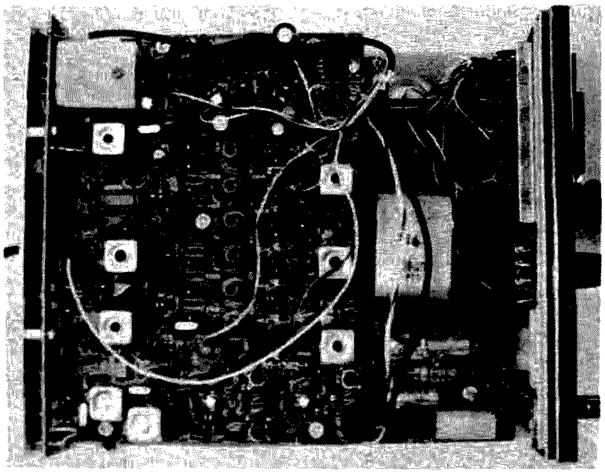


If, for some eccentric reason, you have lately had an occasion to tear yourself away from the rig, you may have heard a song on the broadcast band called "Everybody's Got One" . . . which is also the punch line of a saying popular in some circles, in reference to a delicate part of the human anatomy. Well, now apparently this phrase is applicable to the Heath HW-202, if one listens to and counts the increasing number of these units bringing up the local repeaters. A couple of reasons for this could be Heath's reputation or that it is American made. However, I suspect that the main reason for its popularity is that after catalog shopping and comparing watts and number of channels versus price tag . . . Heath is the winner.

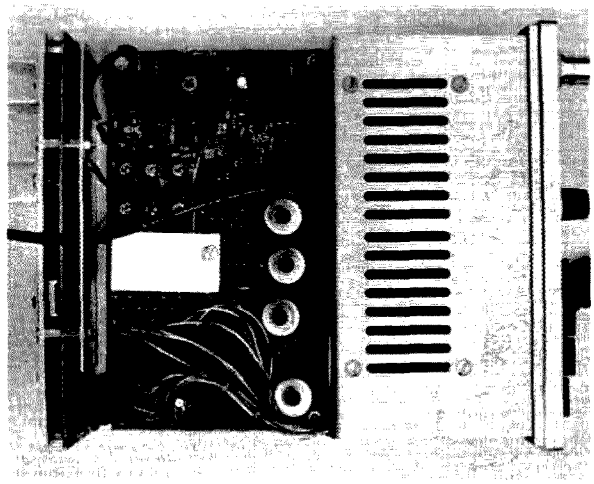
Providing a minimum of 10W out on your choice of 6 crystal frequencies and a sensitivity of 0.5 μV for 20 dB of quieting on 6 receive crystal frequencies, this all solid-state little unit is a box full, as can be seen in the photographs. However, other than for the number of components, all construction is straightforward with no difficult wiring or Rube Goldberg mechanical surprises. In fact, I would say that it is one of the smoothest going-together kits I have yet assembled. Heath's instruction manual, clear and well illustrated as usual, certainly deserves a major portion of the credit for this, especially the pictorial format they have developed. Timewise, you may expect to spend approixmately one hour soldering time on the regular-hash filter circuit board, 3.5 hours on the power amplifier, 8.5 on the receiver, 4 hours on the transmitter, and another 5 hours connecting the wiring harness and the circuit boards on the chassis. In case you don't have your pocket calculator handy, that adds up to 22 hours. The etched circuit boards are heavy duty glass-epoxy and no trouble should be experienced with lifting pads during soldering nor warping in mobile installations where high ambient temperature conditions may be encountered. Incidentally, the transceiver is designed to operate within a temperature range of -12 to +122 degrees F (-25 to +50 C) which is well below and above the operating range of most operators! For those who would attempt to



Top View.

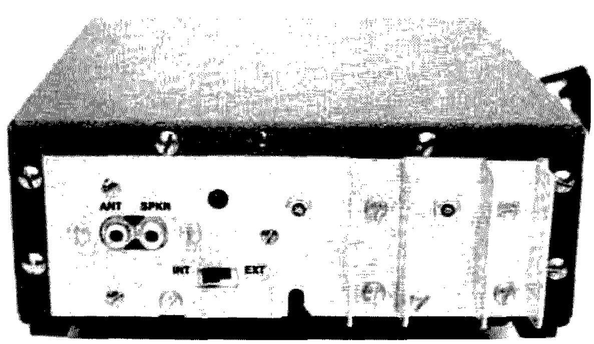
construct such a kit as this without the proper solder . . . Heath includes a generous roll. Are there still creatures walking among us who have not gotten the word about the evils of acid core solder? In addition, a .64 x .80 cm open-end wrench is provided for a few moments use.

A look at the transceiver schematic reveals 33 transistors, 23 diodes and 2 ICs in a fairly standard arrangement. The receiver front end consists of an TCA 40673 dual gate, metal oxide semiconductor field effect transistor (MOSFET) as the rf amplifier, whose output is fed to a second 40673 functioning as a mixer stage along with the output of the crystal controlled first (local) oscillator. The oscillator circuit crystal is selected by pushing the desired front panel buttons and tickled into activity by a 2N2369 and sent to the mixer. The mixer output, which is 10.7 MHz, is fed through a 22 kHz bandpass filter (two double-pole



Bottom View.

crystal filters) and amplified by a MC1350P integrated circuit. Then, the signal is mixed in a 40673 transistor stage with a 10.245 MHz signal from a second 2N2369 crystal



Rear View.

controlled oscillator. The resultant 455 kHz output is coupled to a MC1357P integrated circuit operating as an additional stage of i-f amplification and as a quadrature detector. Now, as audio, the signal is processed by squelch gate, preamp and squelch amplifiers (all 2N5232As) and boosted by the audio amplifier circuits up to 3 watts to drive the built-in speaker.

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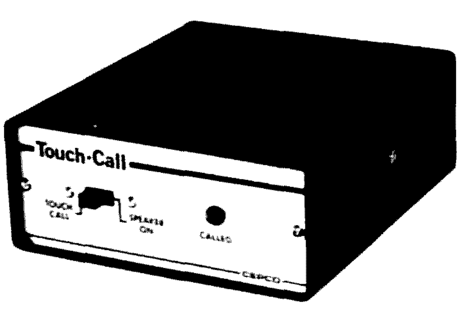

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A SIMPLE MOBILE ALARM SYSTEM

Here's a blue light warning system that will help save your rig from a potential thief.

The alarm described here offers two deterents to the potential thief. First, a small lamp is illuminated on the dash, which tells the thief that an alarm system is probably installed. For those who come in anyway to take the mobile rig, the horn lets go about the time they are ready to make their exit. If you aren't close enough to catch them, they will most likely (hopefully) drop the rig and make their exit posthaste.

The alarm consists of a pilot light (to show at all times on the dash) and an inexpensive SCR. The pilot light is used to provide gate voltage to turn on the SCR, which in turn activates your horn. Pilot-Lamp #1455A draws about 20 mA at 12V. It is intended for 18V operation and the lower voltage extends the lamp life since it is left on all of the time. The 20 mA current drain on the battery is negligible, and the car may sit for two weeks without any appreciable drain on the battery. Any lamp may be used that provides enough gate current for the SCR. I would suggest a blue lens on the lamp socket – it gives a soft glow and you are still alert to the red auto warning lights.

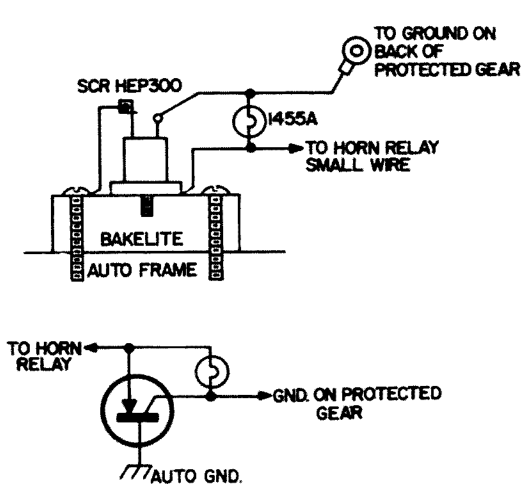

Fig. 1. Shown is the schematic and mounting method for the SCR.

The circuit consists of the SCR, either mounted somewhere on the car frame with the mica insulators, or mounted on a Bakelite block. Heat sinking is no problem. The SCR anode is connected to the horn relay, the small wire that goes to the horn ring on the steering wheel, one wire of the lamp is also connected to the anode, the other wire of the lamp is connected to the SCR gate. The SCR cathode is connected to vehicle ground. The SCR gate is also wired to a ground lug on the back of your transceiver. Once this extra ground wire is broken, the SCR gates on, and the horn sounds.

. . .K6SUB

Ward Stewart VE3FGS
8 Church Street
Penetang, Ontario
Canada

REDUCING MOBILE NOISE

Induced voltages can be a real problem.
Here's one method to solve that problem.

With the introduction of transistorized 2m FM transceivers and various amateur receivers for mobile use, there is a natural tendency to pick up the supply voltage from the ignition switch or the switched terminals on the fuse panel. Reduced current demands have rather obsoleted the old power relay . . . but not quite.

Because of the compactness of wiring harnesses, all kinds of voltages are induced into other wires in the same harness. It is quite possible for your receiver to get alternator, gage, and turn-signal noises induced on the supply line, and much of it will pass the receivers filtering and appear at the speaker terminals.

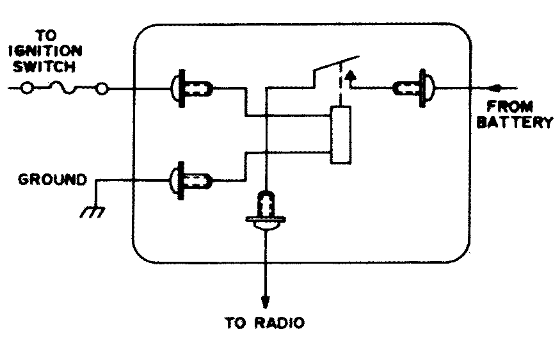

Fig. 1. Terminal layout and internal wiring of Motorola type A relay (bottom view).

The best way to eliminate this problem is to run the supply lead directly from the battery terminal, and route it away from other wiring while keeping it close to the metal chassis parts of the vehicle, which of course are at ground potential.

The battery itself is a big fat capacitor and a beautiful hash filter! But taking our A lead directly from it means we have to turn the rig on by hand for now it won't come on automatically with the turn of the ignition switch.

Here we come back to our old friend, the relay. Any relay with the current capacity for your rig and a 12V dc coil is okay. Your local two-way radio serviceman will undoubtedly have some old ones he would be glad to sell cheap or he may even give them away. If you want a new one, ask for Motorola part number 59K813674. It looks like a horn relay off a car but it isn't! The illustration shows both the physical and electrical layout of this particular relay.

Use of this type of voltage supply will do much to reduce "local QRN" generated by the vehicle. Give it a try.

. . .VE3FGS

Dave Ingram K4TWJ
Rte. 11, Box 499
Eastwood Vil. 50 N
Birmingham AL 35210

THE NEWTRONICS CGT-144 ANTENNA

One of the latest additions to the Newtronics family of outstanding antennas is the CGT-144 mobile antenna for 2m which has a nice gain figure of 5.2 dB.

I recently acquired one of these high gain colinear antennas and was quite impressed with the results.

When the antenna arrived, our weather was cold and rainy, so I really appreciated the quick trunk iip mount, and the fact it was replacing my 5/8 wave Hustler. I just raised the trunk lid, unplugged one antenna from the transmission line jack, (boy that connector is handy!) plugged in the other, slipped the old mount off and the new one on.

Newtronics mentions the antenna needs to be mounted perfectly vertical for best results, and the trunk mount includes a special arrangement in the base so the antenna can be adjusted for perfect vertical alignment, regardless of the trunk's angle. This feature is particularly nice for late model autos.

The antenna worked beautifully right off, and the SWR was very low. In fact, a difference was quite apparent. Fringe repeaters came in solid and new DX repeaters could be heard from my favorite old "prime" locations.

I also noticed my autopatch capabilities were better, and I didn'tsnecessarily need to be in a good location to use it. Indeed, I noticed my TR22,barefoot, now appeared to have the same transmitting capabilities as when I used the 1/4 wave whip and 12 watt amplifier. However, the 12 watt amplifier didn't help on receiving, and the antenna did. This led me to thinking. . .if you have a rig and one of the big 90 watt amplifiers, this antenna would really make a difference; 5.2 dB gain is very close to quadroupling your power. A 90 watt signal would be the equivalent to 350 watts! Then during a band opening if you were atop a high mountain (like Lookout Mountain, Tennessee, where on a clear day you can see seven states) you could really shake up the troops. In fact, mountain tops are especially good for the CGT-144, because of its low angle of radiation.

After really having a ball with the CGT-144 for a while, I decided to run a series of comparisons and the results were quite interesting. I first found a 1/4 wave whip had a noticeable advantage when mounted on an auto roof compared to mounting on the trunk. (In fact, I wouldn't suggest trunk mounting of 1/4 wave whips for low power rigs.) Next I found the BBLT-144 3.4dB gain trunk mount had a noticeable advantage over a roof mounted 1/4 wave whip. Finally, I found the CGT-144 had a very noticeable gain over the BBLT-144, and the 1/4 wave roof mount just couldn't compare to the CGT-144. (I wonder how well the CGT-144 would do on the auto roof!) All the previous measurements were into local repeaters. The CGT-144 did better on "long hauls," (especially from high hills) and seemed to drop slightly when in "holes" between tall hills around town. This is no doubt due to that low angle of radiation the antenna

utilizes. It is, however, superb on the open road compared to other antennas I have tried. The antenna doesn't fall short in the looks department either. It is quite impressive because of the heavy bottom section and tall slender white phasing section. The complete antenna is so tall it generates quite a bit of curiosity.

For those low overhead areas like garages, car washes, bank windows, etc. Newtronics offers an optional, stainless steel quick disconnect (Model QD1). This device installs between the antenna mount and the antenna proper. The bottom section of the whip is adjusted shorter to compensate for the QD1 length, and then you can just slip the whip section off, leaving only the mount. (Some churches use a device similars to this on pulpit mikes.)

Finally, for those interested in using this antenna on a standard 3/8 threaded body mount, the CG-144 is available. This is the complete antenna less trunk mount.

Whichever one you choose, I think you'll find it's a truly outstanding antenna.

. . .K4TWJ

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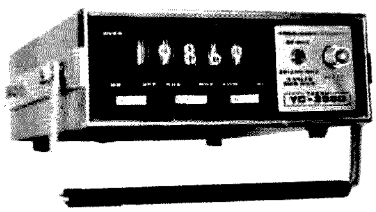

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ANOTHER BURGLAR ALARM

Having read the May, 1970 *73* describing an automobile burglar alarm, I decided to submit a device I have been using for over a year. It cost about $1.50 more than Mr. Laufman's alarm and has been tested by burglars. A portion of the circuit operates similarly to his. It requires a key and is the biggest disadvantage to any alarm system since someone may forget to lock the key part of the alarm before leaving the car. There is in this circuit, however, a built-in second chance to catch a thief.

One night I locked my doors but forgot to lock the key switch on. A thief put a coat hanger between the front and rear windows, opened the door, and started to disassemble my tape player. My tape player has a burglar alarm built into it. It is a simple switch that conducts when a mounting screw is unscrewed. The switch connects to the horn relay. Most experienced burglars know this and cut the wires. The thief who entered my car did not know I had elaborated on this circuit, so cutting the wires caused him to flee.

The heart of the circuit is a silicon controlled rectifier that acts as an open circuit normally. When a positive voltage is applied to the gate, a current will flow from the cathode to the anode. The current will continue to flow until the battery voltage is removed even if the triggering voltage is removed or shorted to ground. There are two ways to make the gate positive in this circuit. In the first, the 100K resistor and the 500Ω resistor make up a voltage divider

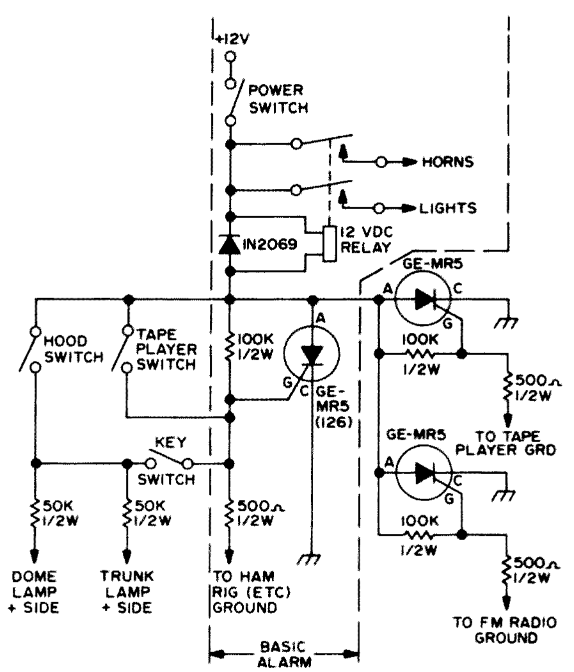

Fig. 1. Schematic

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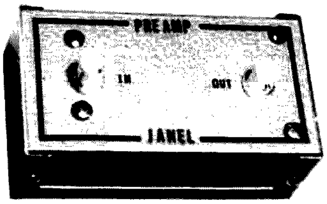

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network and the gate is connected to the center of it. As long as the 500Ω resistor is grounded, voltage at the gate will be very low. If the ground on the 500Ω resistor is removed, the gate will become more positive, the SCR will conduct, the relay will become energized, the horn will sound, and the headlights will shine brightly. Additional triggering SCR's may be added as shown in the right hand portion of the schematic or the ground return wire from the 500Ω resistor may be looped through all your equipment. The second triggering method is to take power from courtesy or dome lights and the trunk light positive side and apply it to the gate of the SCR through the 50K resistor. A switch is used in this line to turn this part of the circuit on and off. It should be a key switch and located near a headlight, grill, or some place where it can't be seen. When you leave the car just lock the key switch.

Don't apply too much heat to the SCR leads or it may not stay latched on or work at all. The anode tab may be cut off if relay current is less than 2 amps but don't short what's left of it to ground or the relay will stay on. If the ignition causes the alarm to trigger, place a 10 μF capacitor between the gate and cathode. If that doesn't cure it, run shielded microphone cable to everything connected to the gate and ground at both ends.

It's a good idea to paint the box black, mount the parts, and place it in a spot so that its whereabouts is known only to you and your spouse. A second horn will delay a burglar if he trys hunting under the hood. You should be able to get to the switch to turn the alarm off if it should go off, but to make it less convenient for a burglar use a key switch. To reset the alarm, shut off the power to it, find out why it went off (open ground of 500Ω resistor or you forgot to shut off the part triggered by the dome, trunk, or hood by shutting off the key switch), and turn the power back on. Most burglars would probably leave as soon as the horn goes off because the price of attempted burglary isn't as high as what could happen if he were caught by the police with your equipment and no receipt.

. . .**WA2OJT**

Bill Hoisington K1CLL
Embassy Village
Muntinlupa Rizac P. I.

TWO HIGH GAIN RF STAGES IN ONE IC FOR TWO METER FM

This article describes a new integrated circuit that not only works well as an rf stage on two meters, but also as *two* of them! The result is a high gain double compound amplifier with low noise, excellent stability due to the low internal feedback, and only two tuned circuits. The RCA chip, CA3102E, four trimmers, and two hand wound coils at 5¢ each, and a handful of .01 discs are about all there is.

In my opinion (although I don't work for RCA) they are to be congratulated on this one. It is really putting ICs into the rf business on VHF-UHF.

Complete design philosophy, construction details, testing and results are given.

The RCA3102E chip. Integrated circuits are certainly "growing up," as far as rf is concerned. This 14 pin dual in line package has two differential amplifiers with associated constant-current transistors on a common monolithic substrate. The six transistors which comprise these amplifiers are general purpose devices which exhibit low noise and a value of Ft in excess of 1 gHz. These features make the CA3102E useful from DC to 500 MHz.

With a maximum voltage rating of 20 volts, no trouble is had with nominal 12 volt supplies or with charging car batteries.

Fig. 1, shows the internal schematic as RCA draws it, and Fig. 2, the way it actually looks and works. Why they insist on drawing it as in Fig.1, I'll never know, at least till my next visit to Somerville, N.J. It certainly is a lot easier to read as in Fig. 2.

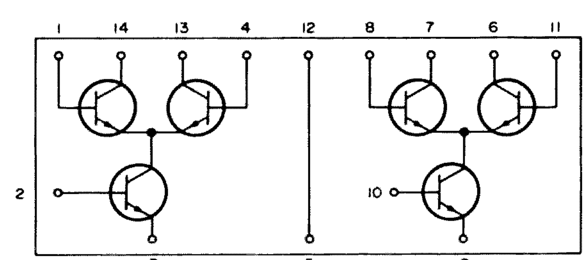

Fig. 1. Schematic CA3102E.

Either of these absolutely independent compound amplifiers may be connected as dif amps or as cascodes, and they may also be used in cascade, which I have done here. The noise figure of either is about the same, 4.5 dB at 200 mHz. I prefer the cascode connection as it has less reverse

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transfer conductance (internal feedback), although the dif amp will handle stronger signals where needed, such as in a repeater receiver, or in crowded areas.

Fig. 3, shows the general differential amplifier connections, in which a common collector amplifier Q2 drives a common base stage Q3. Q1 acts as a constant current source. As mentioned, this is called a compound amplifier. While I have shown three separate dc base bias supplies, in some circuits two of these may sometimes be connected together. The internal feedback of the dif amp is low enough so that neutralization is not required. This dif amp connection handles stronger signals than the cascode.

Fig. 4, shows the general cascode connections for the RCA CA3102E chip, with Q1, a grounded emitter amplifier driving Q2, a grounded base stage. Q3 is not used in this case. This cascode connection has the highest gain and the least internal feedback. Shielding and layout are important if proper advantage is to be taken of the low internal feedback of these circuits. See later paragraphs and figures.

With both of these circuits, if you intend to play around with them, (and you can see there is not much cost involved — not the

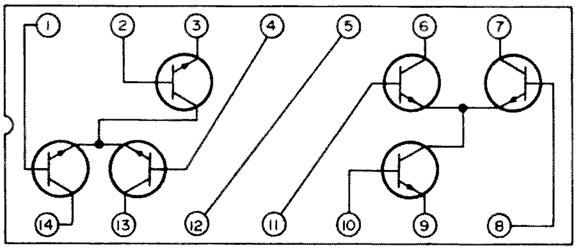

Fig. 2. CA3102E package pin view.

purpose of *this* article) you should definitely make provisions for varying the base and emitter bias voltages, while operating.

Note: Do not do this at first while using a high gain i-f strip. If you wish to *know* how IC rf stages behave, use the set-up of Fig. 5, which will really give you answers. Both the signal generator with infinite attenuator, and the tuned diode receivers have been written up several times in 73 Magazine.

Rf stages for two meter FM using the CA3102E. Fig. 6., shows the entire circuit as

it finally evolved here, after many days of "hard labor" and testing. Again, the test set-up of Fig. 5, was used, with a final check using a second CA3102E as the single conversion front end, a crystal filter for the 10.7 i-f strip for selectivity, followed by the RCA chip, CA3089E as i-f amplifier, meter driver, AGC, squelch driver and squelch, quadrature detector, and af, as detailed in Dec. 1972 magazine. Which one? 73 of course. In detail, the cascode connected compound amplifier formed by Q1 and Q2

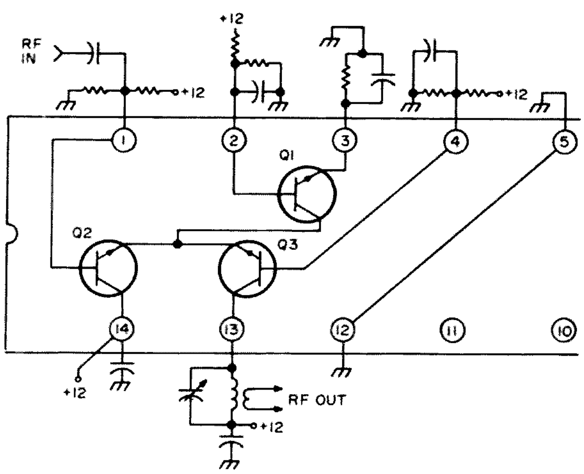

Fig. 3. Differential amplifier, general schematic.

has Q1's base input tapped down on L1 for low impedance matching. This base input is pin 2 of the CA3102, as can be seen on Fig.6. The antenna cable series matching capacitor C1 will match almost anything, with an assist by varying the tap on L1. Pin 2, the base of Q1, could also be varied for low noise purposes if you were scratching for the last possible fraction of a dB. R1 and R2, if you are going to change them for test purposes, should only be adjusted in relation to the other DC bias resistors R3, R4, and R5, as you will find they are naturally somewhat interrelated.

Capacity coupling between the two cascodes. After much work with coupling circuits using inductors, taps, double-tuned circuits, plus considerable study, the collector of Q2 was simply brought out to a resistor whose final value turned out to be 470 ohms, and a .01 coupling capacitor over to the input of the second cascode, Q4 and Q5.

Further notes on tuned circuit coupling between cascode #1 and cascode #2 (left

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and right half, respectively, on Fig. 6). I got quite a shock while testing various circuits here. The sensitivity, into a simple diode detector, at times was equal to that of a good superhet receiver using good FET's in the front end! Of course, when you consider that the combination of the cascode Q1 and Q2, in cascade (note that second *A* in cascade) with the second cascode Q4 and Q5, uses four active, lively, hot, transistors, all good for 500 mHz, this is perhaps not surprising. Nevertheless, I *was* surprised. I always figure that every day should bring at least one new piece of knowledge, and one of my very favorite mottos is "Knowledge is always preferable to ignorance." However, all that sensitivity is not really needed here. The simple coupling using R4 makes an excellent two stage rf amplifier, which is really a four stage job counting all the active devices used, in the CA3102E. *And,* it

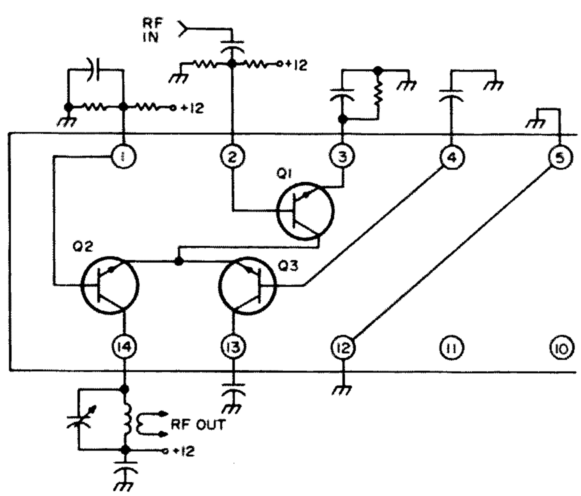


Fig. 4. Cascode rf amplifier general schematic.

handles nice and smooth, nothing tricky about it, no oscillation, and still has about the sensitivity of a good superhet, without rf stages in front.

Last minute note from RCA, use a tuned inductor across the 470 ohm resistor in Q1's collector. This can cut down another fraction of a dB on the noise figure by narrowing the bandwidth of that coupling circuit.

Shielding. As RCA says, "Shielding is important, if you wish to realize the benefits of these cascode compound amplifiers." Indeed it is. With so much gain, nuisance currents can be found even on the flat copper base board used, 20.32cm wide by 10.16cm deep. After considerable trials, and not wishing to get into "brass boxes" which are a mechanical nuisance and difficult to build, (I never could make those *corners* come out straight!) the simple shield as in Fig. 7, does the trick. As well as reducing coupling through the air, it seems to reduce surface currents through the copper surface of the baseboard.

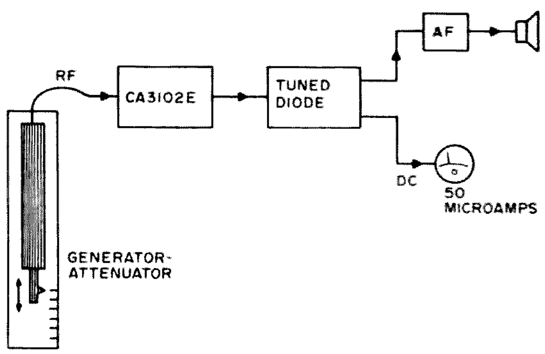


Fig. 5. Test set up, CA3102E rf stages.

Second cascode. So now we come straight into Q4, the first stage of the second cascode. Again, if you monkey with the base bias resistor R5 and R6, do it in relation to the other bias values of Q4 and Q5. R7, the emitter resistor of Q4 stabilizes well at 470, (this "stability" by the way, refers to the changing of values as you proceed with the testing), but the base bias of Q5 requires a little attention though it is not critical, using 10K to ground and 15K to the +12 volts.

The collector circuit of Q5 started to give me a lot of "static" (trouble, not noise) at first, but after eliminating the parallel tuning on L2, which caused bad 600 mHz oscillation, and going to series tuning, L2 and C3, no more 600 mHz crud. For a 50 ohm cable output, C4 will be found to do a lot of the tuning on L2, which is only natural. C3 can almost be omitted for certain "not completely matched conditions at the far end of the output cable." Better leave it in though, and bring up the match into the mixer section. When this connection to the mixer is only short, such as 2.54 or 5.08 cm you probably will have

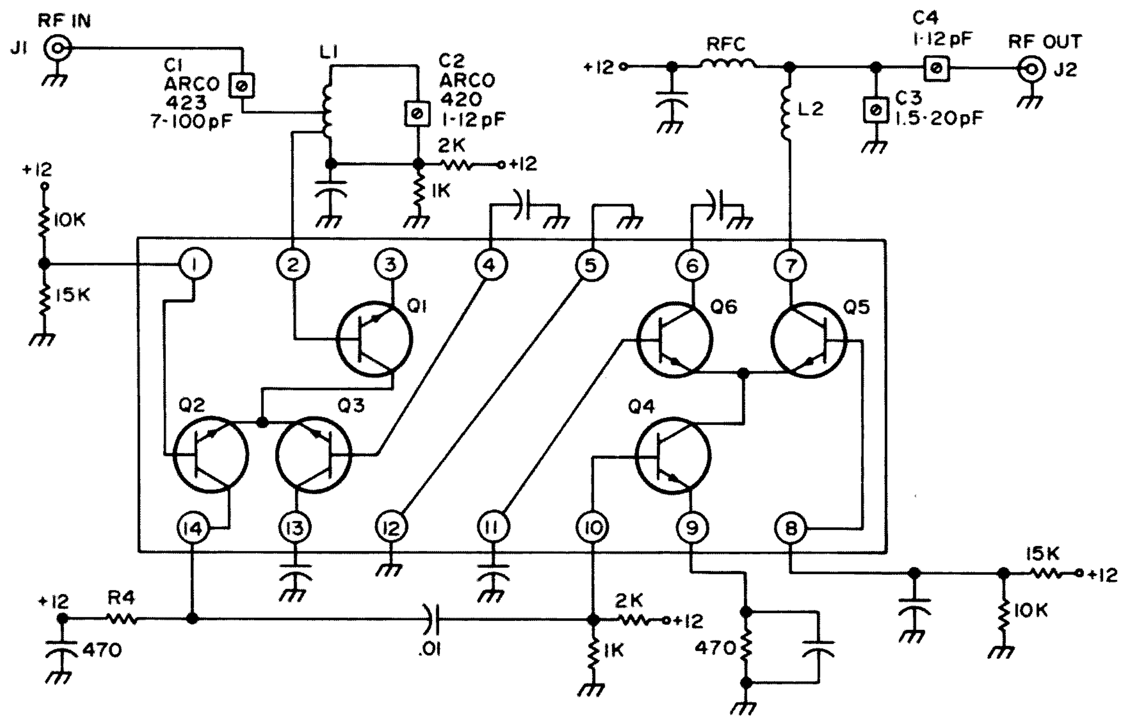
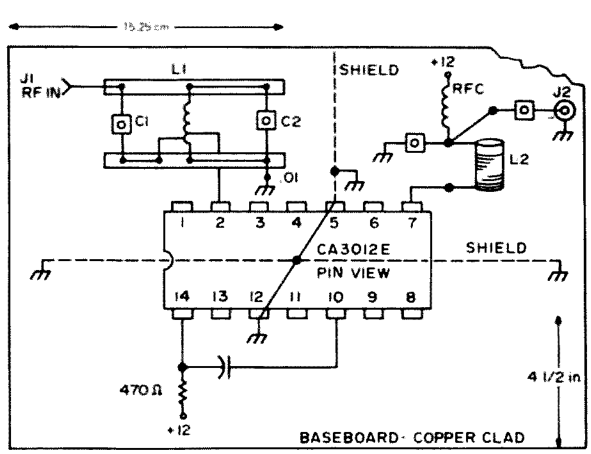


Fig. 6. rf stages for 2 meter FM using the I.C. CA3102E. L2 to resonate to 2m.

no trouble. Where you use a long cable, with perhaps a 1/8th wave or so standing on it (or in it) (such as 22.56 cm) you will have to work a little with C3 and C4. Again, the test set up of Fig. 5 will do the job for you, allowing you to measure (relative values, or even actual microvolts if you calibrate the infinite attenuator against a known "microvolter") and listen at the same time for noise, unwanted spurious, squegging, etc.

Layout and shielding. These are important for a project of this kind, but not critical. I turned the 14 pin in line package upside down and used my regular tie points made of common pins, 5.33mm O.D. hammered into 5.08mm holes in a piece of fiberglass about 3.81cm x 2.54cm wide, as in Fig. 7. Using small clean copper wire or small tinned bus, solder each lead of the CA3102E to these pins, and make all component connections to the tie pins to avoid breaking a lead on the 3102E. I ran a wire over the package from pin 5 to pin 12 and then to ground on each side. Then I also brought the shielding over the package, with a cutout, and soldered it to the wire going over from pin 5 to pin 12. Keep all those 2.5mm bypass leads very short. The average length here is a 3.18 to 4.76mm long. If you keep everything close to the package you will find that quite a small baseboard will result, which you can easily install in an aluminum minibox, with J1 on one end and J2 on the other. Or on the same side if you are careful with possible coupling. Remember, about 40 dB gain or more between those two points.



NOTE · VERTICAL EXTENSION OF SHIELD IS 2.54cm

Fig. 7. Layout, shielding two meter rf stages using CA3102E.

Conclusion

This little unit is one of the smoothest tuning jobs I have ever seen for 2 meter FM, especially when you consider that gain. And an IC at that! You can see where the future lies.

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Many amateurs have been using the Oscar series of satellites and the popularity of satellite QSO's is bound to take another great step forward when Oscar 7 is in orbit. Many still have not heard the present satellite in operation or are trying to receive the down-link (29,450–29,550) on present 10 meter gear. The disadvantage to the latter is that the sensitivity of the receiver position of many 10 meter transceivers starts to fall off significantly at the high end of 10 meters. This article describes a high performance converter specially designed to receive the Oscar 10 meter down-link. It can be used with an existing single or multiband HF transceiver with the transceiver tuning a 100 kHz portion of any lower frequency band or the converter itself can be made tunable for the Oscar down-link and worked into the fixed i-f (preferably above 1 MHz) of any existing transceiver or receiver.

The converter itself features excellent sensitivity, selectivity and freedom from cross modulation. Construction is simplified both because of the requirement to cover only a relatively small bandwidth and the method of construction used.

Circuitry

The circuit of the converter is shown in Fig. 2. It consists of two stages of rf amplification using JFET's in a grounded gate configuration. The JFET's are 400 MHz low-noise types but yet are not expensive (about $1.00 each). The grounded base configuration does not provide the absolute low noise figure of a neutralized type FET amplifier but its excellent freedom from cross modulation and stability more than compensates for this on 10 meters. Its noise figure of about 2–3 dB even in the grounded gate configuration is more than one needs on 10 meters for Oscar reception (or any weak signal reception for that matter on 10 meters). The four tuned circuits provide fine selectivity and by peaking these circuits for different portions of the 100 kHz wide down-link, even performance is achieved throughout the 100 kHz range without any need for continuous tuning of the circuits. The mixer stage following the two rf stages

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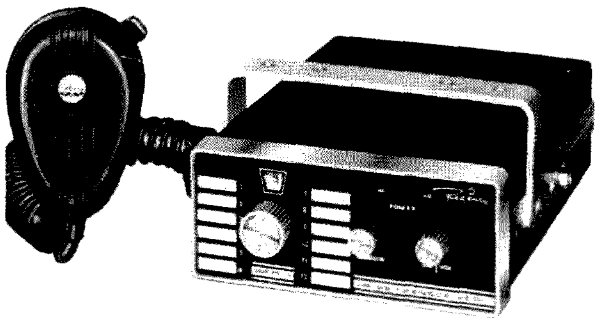

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To give plastic a new lease on life wet a soft cloth, add a small amount of toothpaste and rub lightly. Use a sweeping motion and avoid concentration on any one spot. If the paste tends to smear, add a little more water. When the job meets with your approval, rinse in hot water and dry thoroughly with a soft, dry cloth.

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is a MOSFET to continue the good cross-modulation qualities of the converter and to provide for a minimum generation of spurious mixing products. The input signal is fed to one gate of the MOSFET mixer and the local oscillator signal to the other gate. The local oscillator signal is generated by either a crystal controlled FET oscillator or by an alternative vfo using a FET. The alternate vfo circuit is shown in Fig. 2.

The frequency of the crystal used in the oscillator will, of course, depend upon the tuning range one is trying to shift the Oscar band down to. For instance, if one intends to tune the Oscar band on the 7000–7100 kHz range of an existing transceiver, one needs a 22.450 MHz injection frequency from the FET oscillator. A 11.225 MHz fundamental mode crystal would be used and the tuned circuit in the drain of the FET oscillator would be tuned to double the oscillator output to 22.450 MHz. Unless one needs exact calibration, a surplus crystal can be found at low cost which will suffice rather than ordering a new crystal. It should be mentioned that the total Oscar down-link extends a bit more than from 29.450 MHz to 29.550 MHz. It extends 70 kHz either side of the above frequencies but at these extremes its effectiveness is down 10 dB as compared to that of the prime passband.

Since any i-f can be used, one has quite a bit of latitude when choosing a crystal frequency, at least for the initial setup of the converter. The same is true of the vfo circuit range of Fig. 2, in case one wishes to work the converter output into a fixed i-f. The vfo circuit itself does not employ any multiplication and operates at the desired injection frequency. Nonetheless it is quite stable and easy to tune as long as one takes care to make the LC circuit mechanically stable. Be sure that the two fixed capacitors in the gate circuit of the oscillator are of the silver-mica type.

The output circuit of the converter is shown only as a single tuned circuit. This selectivity is adequate since the unit the converter works into should provide the prime signal selectivity. If a very short lead is

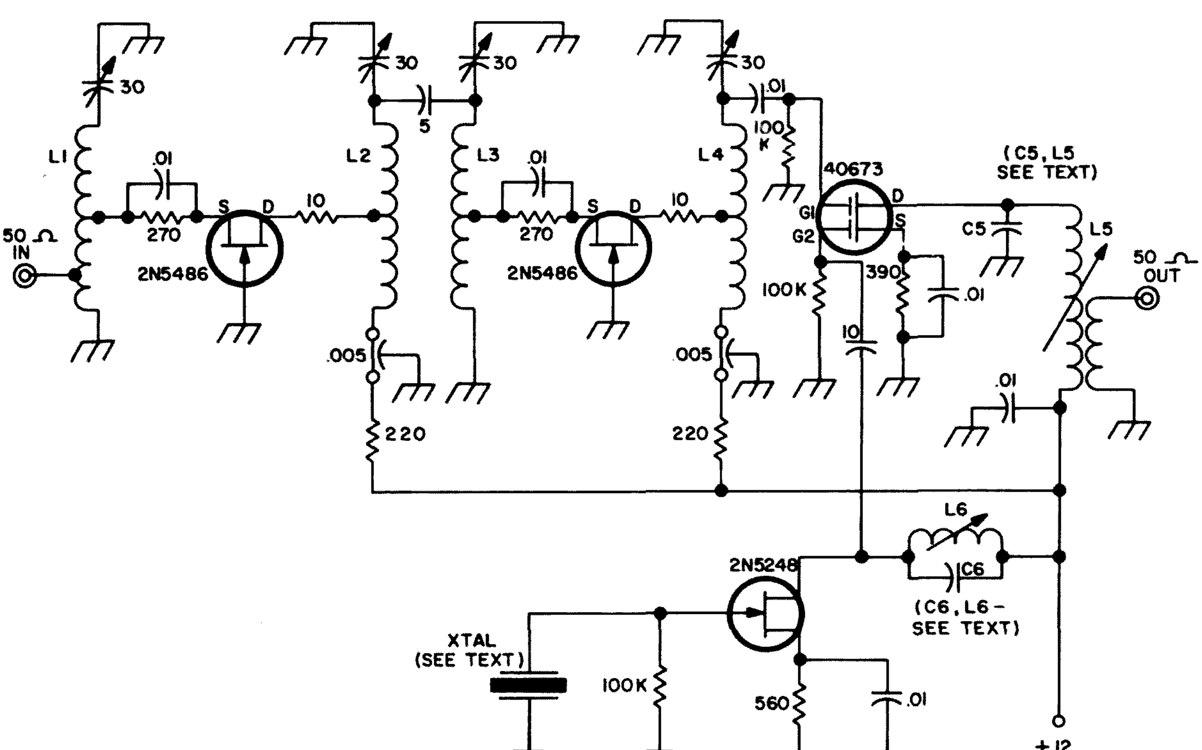

Fig. 1. Crystal controlled converter circuit. L1 through L4 = 0.9 μH, 10 turns, 1.58 cm dia., 16 T.P.I. Tap all coils at midpoint and also tap L,2 turns from ground end.

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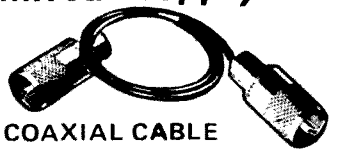

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used between the converter and the following unit, one can probably eliminate the tuned circuit altogether (replace it with an rf choke) as long as a tuned circuit is immediately present in the following unit.

Construction

There are very few critical points to be considered in the construction of the unit. A suggested method of construction is shown in Fig. 3, although other methods are certainly possible. The method shown utilizes a copper clad board but the board need not be etched and it is used with the copper side tuned up. The board size is about 6x14 cm. Smaller pieces of board (or copper sheeting) are used as shields between sections of the rf stages. Most of the details of construction are shown but a few points should be made.

Construction is best started with L1. One end is soldered directly to the board and the other to its associated trimmer. A small hole is drilled in the center of the first shield. The gate lead is soldered to the shield board near the hole with the shortest possible lead length. The 10Ω resistor is attached to the source lead of the transistor and centered in

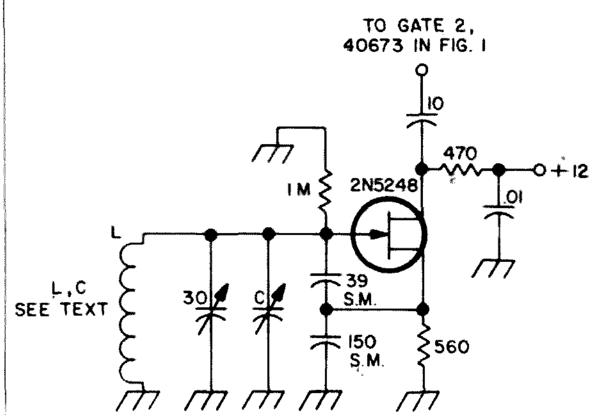

Fig. 2. Vfo circuit to replace crystal oscillator circuit of Fig. 1, for a tunable converter.

the hole. The resistor/capacitor combination is soldered to the drain lead with about 4 mm lead between the combination and the transistor case. The shield board is then placed on the main board and soldered all along its bottom edge to the main board. Connections are then made to L1. Construction is continued in a similar manner for the remaining sections. The feedthrough

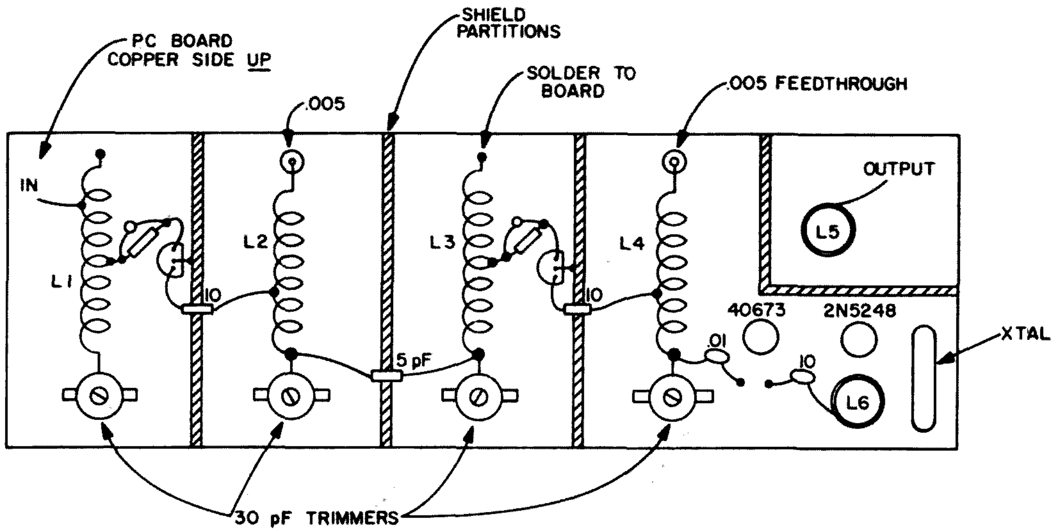

Fig. 3. Parts layout. Exact layout shown need not be followed but shields should be placed between coils shown. Remaining components, as explained in text, are places on underside of board.

capacitors at L2 and L4 are soldered to the board and the +12V connections made on the underside of the board. The mounting of the mixer and oscillator stage transistors can be done with sockets if desired. In either case, to accommodate either the leads of the transistors or pins of the sockets, a hole is drilled first just large enough to accommodate the leads or pins. The tip of a larger size drill is then used to clear enough copper away from around the sides of the hole so no danger exists of shorting to the board. Component ends which are grounded require of course only the lead hole. The components themselves are mounted on the underside of the board with the component lead ends requiring grounding brought up through to the top of the board and grounded. The whole method of construction is a bit unusual but leaves a maximum amount of copper left on the board for good shielding and grounding. Tie points underneath the board such as for the +12V line are made by miniature terminal strips mounted on the underside with regular metal hardware. The whole board can be mounted in a separate enclosure or inside an existing receiver.

Adjustments

Alternate tuned circuits in the rf amplifier stages are tuned to opposite ends of the 29.450–29.550 MHz range. That is, the L1 circuit peaked at 29.450 MHz using a signal source at this frequency, the L2 circuit peaked at 29.550 MHz etc. The tuned circuit in the drain of the crystal oscillator stage is peaked at the desired output frequency using a receiver or grid-dip meter. The circuit is then tuned sufficiently off resonance to produce from 0.5 to 0.6V across the 100K resistor at the second gate lead of the mixer MOSFET. If a variable frequency injection oscillator is used, its tuning range should first be checked using a receiver. The voltage it develops across the 100K resistor should be also 0.5–0.6V and adjusted if necessary by changing the drain load resistor in the oscillator. If one cannot measure these voltages, just make sure the oscillator stage is operating on the desired frequency. The injection voltage level can then be adjusted during actual reception for the best sounding results.

Conclusion

The converter described in conjunction with a reasonably sensitive receiver or transceiver will provide excellent reception of Oscar 10 meter signals. The old rule about the antenna still being the most important part of any receiving system still holds true, but even with a 10 meter ground plane one will be able to hear Oscar for most of the time available during each of its passes.

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JAZZ UP YOUR 24-HOUR CLOCK

The idea presented here is neither ingenious nor novel; but with just a few hours work you can add usefulness and a little class to that station timepiece.

The big thing in your life might be message handling, QSLing, contests, DX, ragchewing or what have you. No matter what it is – if you give a hoot about it, you insist upon a certain degree of time accuracy. Should the commerical ac power fail for a few seconds or a few minutes, without your knowing about it, this accuracy could be destroyed.

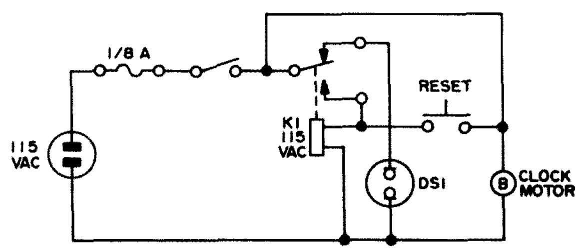

Fig. 1.

With this simple clock modification, an alarm lamp will come on any time the ac power has failed and then been restored. The lamp will remain lighted until you reset the circuit. Should you awaken some morning and see the "power fail" alarm, you'll know that a quick check with WWV is in order. Also, the rest of the family is thereby alerted to check the other clocks in the house.

The on/off slide switch is included for convenience. You can preset the clock, then operate the switch at the exact moment the WWV tone begins.

...K7KHA

Sumner Eagerman WA1JOS
1450 Worcester Rd., Apt. 8516
Framingham Center MA 01701

TOWARD MOBILE SECURITY

Helpful hints on how to protect your gear from the potential thief.

With the emergence of two meter FM, more and more amateurs are investing in good two meter mobile rigs. As most of us who have gone mobile know, we dislike leaving a mobile rig unattended for fear of its absence on our return. What can be done?

Being involved in automotive security, I am asked many questions as to what a person can do to add extra security to his car. One of the major problems I have encountered is that people are very reluctant to spend money on security. However, one does not always have to spend a lot of money to protect his car a little bit more.

Before going mobile one must consider three things: type of rig, type of antenna, and a suitable mounting location for each. The type of rig is independent from the view of security. The antenna, as well as the mounting locations of the rig and antenna should be considered as a security factor.

Let's consider the antenna and its mounting first. As we all know, there are many types of antennas to choose from. Each has its own points. I look at antennas under two categories, permanent and temporary mounting. Again, each has its own advantage. From the viewpoint of security, there is no question as to which type of mounting is best. The temporary antenna will perform well at any point in the car, will not hurt the value of the car come trade-in time and can be moved to the XYL's car easily if yours happens to break down.

Now let's consider the type of mounting and location of your rig. The standard location for mounting is under the dashboard and it provides the driver with an easily reached unit. I have no complaints about that, but I would like you to consider these options: inside the glove compartment, under the driver's seat, inside a console, and – if you have bucket seats – how about between the two buckets. As you can easily see, there is a large selection of locations to mount your rig. I named only a few. The location is your decision. But don't forget that the easier it can be seen, the faster it will be stolen. That's where the type of mounting comes in. Just like the antennas, there is either a permanent or temporary type of mount. You're probably saying to yourself, "I've never seen a rig on the market that provides a temporary mount." You're

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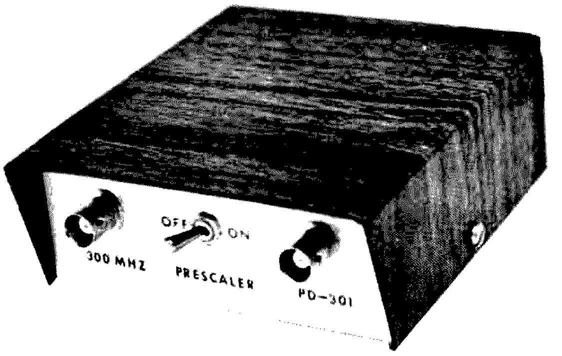

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probably right; to my knowledge there is not. Although many manufacturers provide a thumb wheel dismount for their rigs, I don't consider this type of mounting to be temporary. One must still disconnect all the wires leading to the rig before it can be removed.

But just because rigs are considered permanently mounted does not mean they have to be: there is a new item on the market today called the universal lock mount for car tape players. This piece of hardware will work fine for almost any mobile rig on the market today. The universal mount consists of two interlocking brackets. One bracket mounts permanently to – let's say – under the dashboard, the other bracket mounts directly onto the rig itself. When the two brackets are joined together, all electrical connections with the exception of the antenna lead are made by a pressure contact terminal strip. The cost of the unit varies depending upon the store, but is usually in the range of $5 to $10. It can be picked up at just about any car tape supplier, Lafayette, Radio Shack, and at many discount houses that carry automotive car radios.

Getting back to the purpose of the universal mount, it enables you to mount your rig anywhere in the car and be able to remove it with a simple press of your finger. Once the unit is removed it can be put into the trunk, brought into the house, or put into another car where it can be used again with a simple purchase of another mounting bracket and antenna.

Apart from the mobile rig and antenna, what else can one do for added security? Here are a few inexpensive ideas:

1. Remove the finger button lock on the doors and replace it with a bullet-shaped finger button. This defeats the use of a coat hanger.

2. Obtain security decals from a local alarm company. These decals should be placed on the rear window on both sides of the car.

3. Obtain a key lock used for car alarms from a local alarm company. This lock should be mounted on the front left fender in plain sight. (Don't be afraid to let them know there might be an alarm.)

One final idea to add to the security of your car would be to have an automotive alarm installed. There are many brands and models available today, so shop around and compare them all. Here are a few tips on what to look for:

1. What type of siren does it have, mechanical or electrical? (I've had better luck with mechanical.)

2. Try to choose a system with a voltage drop sensor. This type of system will give you better protection.

3. Be sure they install a security lock (round key).

4. Consider having a motion detector installed (similar to a tilt on a pinball machine).

5. Be sure you receive a written guarantee from the installing company.

Finally, security does not end with an alarm system. As a matter of fact, security is endless. Don't consider it to be a one-shot deal, it's a day-by-day practice. The more you practice it, the safer you'll be.

One closing thought: The best security in the world is to have nothing to steal.

. . .WA1JOS

Scott Baxter WA4BXI
111 Acklen Park Drive
Nashville TN 37203

IMPROVING THE PEARCE-SIMPSON GLADDING-25 AND BIMINI-VHF

Pearce-Simpson, long well-known in communications gear, has recently introduced a VHF-FM transceiver which it supplies in two versions (the Amateur Gladding-25 and the Marine Bimini-VHF). The marine model is FCC type-accepted, and the amateur version is virtually identical. Features of both units include 25 watt/1 watt switch-selected power output, sensitivity typically 0.22 μV for 12 dB SINAD quieting, and squelch adjustable from "open" through clean thresholds of 0.1 to 1.0 μV "full tight." Selectivity is ±7.5 kHz at the edges of the sharp crystal filter, ideal for amateur "compromise" deviation or strict narrow band systems. Present production Gladding-25's feature a concentric 6 channel independent transmit/receive crystal switch. (The concentric switch is available free for Gladdings now in the field and can be added to a Bimini for $8.50).

The Gladding-25 is furnished with a palm PTT microphone, while the Bimini-VHF comes with a handset. Prices of the units compete with the cheapest "amateur" products, including the imports. The amazing fact is that the gear is type-accepted, and it performs. Service is easy too, because you don't see plug-in transistors, all-Motorola and RCA transistors and ICs, and fiberglass boards in the imported sets. Because the Bimini-VHF appeared first in this area, several of them were already converted to two meters by the time the Gladding-25 was in town. Dealer cost is about $160 for the Bimini-VHF with no crystals, and about $180 for the Gladding with 4 crystals of the buyer's choice.

Additional crystals from Pearce-Simpson are $4.50 each, although you may wait up to six weeks for unusual frequencies. International can deliver quickly, but at $9.25 transmit/$11.25 receive.

Like most new products, these sets have a few minor bugs. If you decide to buy one, you will want to check it against the following information. Some of these changes are now being incorporated into new units at the factory, while some are original with the writer. Sets from dealer's shelves may or may not contain any of the following. In over a dozen of the sets, no problems were experienced after these changes were made.

Converting A Bimini-VHF To Two Meters

In the event you have a Bimini, you can easily convert it to two meters. It should be mentioned that this is not preferable to buying a new Gladding, but many amateurs did not expect an amateur version so soon and a number of Biminis are now in amateur hands. The conversion introduces no special problems and performance is about equiva-

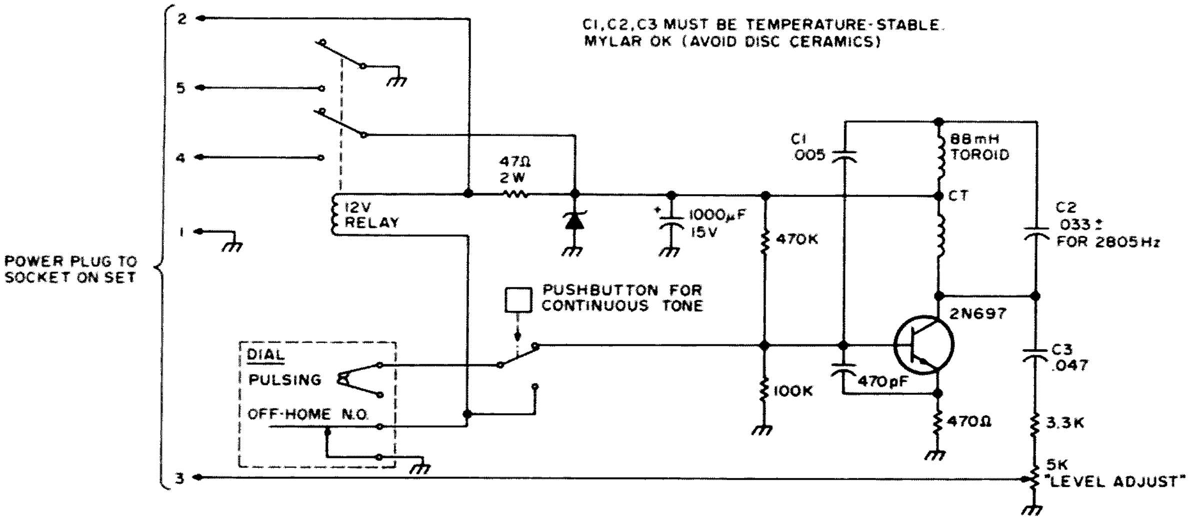

Fig. 1. 2805 Hz on-pulsing encoder.

lent to the Gladding, but the warranty remains an open question.

Conversion consists of disabling the receiver split-tuning circuit by removing R229 and tying together all the front wafer contacts of the channel switch. L201, L202, L203, L204 and L206 are then tuned for best quieting. In most sets, no padding is required. However, an extra picofarad can be added across any of the coils which fail to tune before hitting bottom.

A single crystal can be used on more than one channel in the Bimini (or a Gladding with the old switch), provided the paralleled rear lugs are bent away from the shorting ring on the affected wafer of the channel switch. For a transmit crystal, the trimmer capacitors of all but one of the paralleled switch positions should be disconnected.

Improving Receiver Sensitivity

For full sensitivity of about 0.22 μV, check the value of R209. In early units this resistor was 15K. Best sensitivity occurs when this is changed to 3.9K. Paralleling a 5.6K across the 15K will serve nicely for the earlier version. A 1/4 watt resistor is satisfactory.

Audio Distortion in The Transmitter

The microphone amplifier, Q501, tends to saturate above room temperature. Change the emitter resistor R504 from 22Ω 1/4 watt to 30Ω 1/2 watt.

Because the basic audio circuit was developed for mike-shy boat owners, the average amateur's hearty and robust tones are likely to cause excessive clipping. In most sets I have seen the mike amplifier itself driven to clipping at moderate audio levels. Change the mike series resistor R101, located between terminal strips on the bottom of the set, from 470Ω to 2000Ω. Your friends will thank you. After these changes the audio will probably receive compliments; the frequency response of the total system is ideal for reliable communications through noisy FM channels.

Pilot Lamp

Paralleling 33Ω (1 watt) across the lamp will increase the life. There's a difference between 12V and the 13.6 in most automobiles.

Receiver Oscillator

By far the most frustrating problem in the receiver is the first oscillator. After a transmission or two, the rig's internal temperature rises slightly and the oscillator quits. This development had almost eliminated longwinded QSOs on the local repeaters before the problem was found. Although the condition can be aggravated by cheap crystals, it is due primarily to changes with

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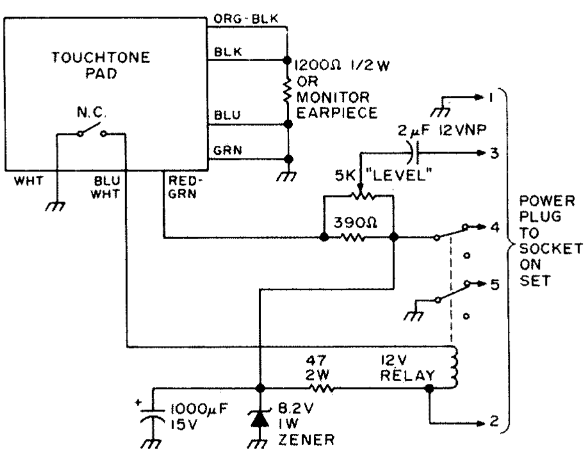

Fig. 2. Touch-Tone encoder.

temperature in the value of R222 and R223. The little 1/4 watt resistors have adequate dissipation but their tolerances under ambient variations are very poor. Replace the two with 1/2 watt 5% units of the same value and leave 1/4" leads above the board. Solder lightly and quickly. Check C226; if yours is .001 µF, change to .003 µF. This increases the drive slightly and can make a real difference, especially if your crystals do not quite make the manufacturer's specifications of 40Ω or less equivalent series resistance.

You may note that there are no trimmers on the receive crystals. This presents no problems with original crystals or International replacements. However, a few owners have complained about distortion on some signals. Provided you have an on frequency signal with 5 kHz deviation, you may want to tune T401 for minimum distortion. One-fourth turn is probably more than the required correction. Of course no amount of tuning T401 can correct for an off frequency signal or overdeviation. The crystal filter is sharp, and if the incoming signal is not reasonably close to its center frequency, you can expect distortion just as you would with a brand new MICOR.

Encoder Operation

Encoder use is made more complicated by the requirement that the mike, handset, or encoder directly switches the receiver/exciter B+ voltage. There is no adverse effect in leaving the receiver voltage on during encoder transmission, so the encoder need only provide an extra contact closure to perform all keying functions. Connections for the excellent encoder circuits which follow can be made through the existing rear-chassis connector. Because the W4AY autopatch uses 2805 Hz "on-pulsing" instead of the Secode or "interrupter" type, the tone encoder shown is for that system. The dial pulsing contacts could, of course, be used differently to produce the other system. The Touch-Tone circuit shown has also been used extensively on W4AY, with excellent results.

The following internal connections must be made in the rig to permit encoder operation:

Attach a 5.6K resistor to the junction of R510 and R511 on the exciter board. Run a wire from the free end of this resistor to pin 3 of the power connector.

Run a wire from the yellow mike/handset lead to the power connector pin 4.

Run a wire from the red handset lead to power connector pin 5. This completes the required changes in the set.

. . .WA4BXI

Henry B. Ruh WB8HEE
140 Ash
Whitmore Lake, MI 49189

PUTTING YOURSELF ON TV

Many of us who are on A5 (wide band TV) on 450, 1296 etc., often have a desire to put some of our goodies over the YL's TV, as well as our own. Usually most YL's object to the OM "messing around" with THEIR TV. A sure-fire way to encourage her to be less obstinate is to put her mug shot over the walnut knothole, and surprise the kids (hey look at mommy!).

ATV Research has a little device at a ridiculously low price which can be put together in a few minutes time, and provide enough RF on a desired TV channel to please everyone in the house. Their PIXE-VERTER (From ATV, 13th & Broadway, Dakota City, Neb. 68731, for $6.95 & shipping) is a small modulated oscillator using a single transistor and a pc board coil to generate a small signal which can be adjusted to any channel from 2 to 6. A few changes in their basic circuit help the unit in flexibility and performance. The kit as arrived here was complete and needed only a small power source (6 volts at a few mA) to fire it up. Video is ac coupled through an electrolytic capacitor to avoid any dc voltage problems, making it an ideal general purpose generator. It was found that it was able to modulate a video signal with 1.5 MHz as top frequency response. Since the circuit is very non-critical, it is easy to experiment to try to improve on the basic design. First, to improve low frequency response (like sync signals) replace the 10 μF video input capacitor with a 100 to 250 μF unit. To improve high frequency response, put a 5 to 10 pF capacitor between the input of the coil and the output tap. This is a small area of foil near the coil and has 1.5 pF coupling for the rf out. Increasing this coupling provides better output, better frequency response, and appears to help stability which is already quite good. A 2.7k resistor between the collector and ground also helps frequency response without appreciable loss of output. Better response can be had with lower output by going to a 1.8k resistor, but for most applications, the change is adequate with the 2.7k. Care must be taken for if you go to low, you will overload the output and the unit will not oscillate.

Depending on the characteristics of each transistor, the 15K bias resistor may have to be changed to 18K or 22K to prevent sync compression (low sync but normal video). The supply voltage should be stable and 6 volts seems optimum. Less voltage and the unit won't oscillate, and more voltage tends to produce white compression (lack of detail in bright areas).

If you replace the 10μF disc capacitor between base and collector with an erie 9-20 pF or similar small trimmer disc (like those used to net rocks in FM rigs) you can "net" the frequency after you find the approximate spot on the coil tap. It helps if you put in the fixed unit first, run the wire around the coil until you find the spot to produce a signal in an unused channel of your tv, then replace the 10μF with the trimmer, and while watching the pix on the tv, adjust the cap for best signal.

In the photo you can see where I mounted the coupling capacitor and padding resistor on the foil side of the board. There are spots in the foil where you could drill through and mount the parts from the component side if you like, but it's not critical. You will also note a pot in one corner. This is used to adjust the video input since I use it with several sources of varying voltage level. It's most happy with a video signal of .5 to 5 volts, but with a pot, you can use most any signal to be had.

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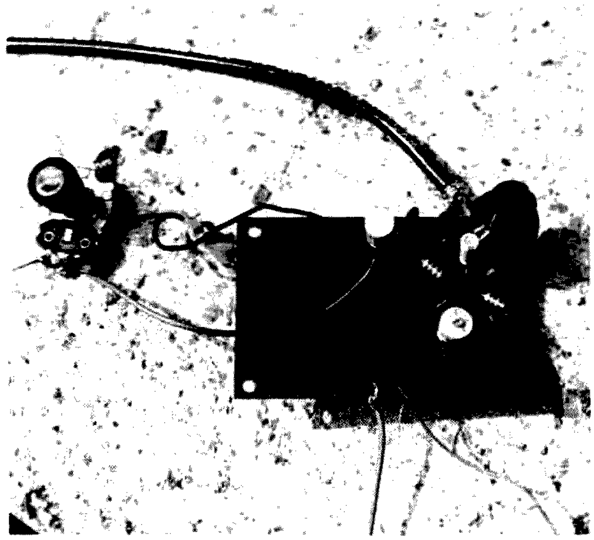

ATV Reaserch "pixi-verter" modified with trimmer capacitator level control, upper right. Voltage control on left

I run my video tape recorders playing into the PIXI-VERTER into my Heathkit Color TV, which won't accept a video signal since it pulls sync from the i-f tube and video from the output side of the transformer which makes it somewhat less than useful for reproducing a video tape playback. The rf unit is clipped leaded to the antenna terminals in back.

Hooking the little device to the roof top antenna produced a good signal in the neighbors TV sets, which helps to drive the drabs up the wall when they dial past a "vacant" channel to see a clear "Sonny and Cher" program on the wrong night, without commercials and no sound. (I use my stereo for the audio.)

If you feel like being nice, you can add an ATV Research audio subcarrier generator ($18.95 and easy to build in an hour or so) and provide audio in the appropriate relationship (4.5mHz removed from the video carrier) and go wireless completely.*

Besides putting yourself and family on TV, its a lot of fun to put a camera in hiding and casually dial the TV to the signal when there are visitors and catch the comments as they notice that they are on TV! There are more serious applications of course, but it can be a lot of fun too.

. . . WB8HEE

* *Available from ATV Research for $18.95.*

Jon Matthews WBØFKZ
2609 S. Glendale Ave
Sioux Falls SD 57105

CATCHING THAT TWO METER STREAKER

The author in disguise.

The public service record of 2m FMs brief history has been rather outstanding – lives have been saved, pizzas have been ordered, ideas on diciphering tax laws have been exchanged, and dozens of new jobs have been created in Washington for out of work cryptographers because of someone's intense love for creating repeater regulations in the form of crossword puzzles.

But all of these heroic and patriotic deeds fall flat on their face like QRP to a 2K-4 when compared to a recent but little known incident involving a college FM repeater club faced with having to net the biggest catch in the history of ham radio – a 2m streaker. And believe it or not, he was running barefoot!

It was a beautiful spring evening with the sun slowly scanning the lower half of our ham club's 20m beer can verticle when we first received word that our college President desired a "word" with us. Needless to say, the eight of us in the club were highly worried about the meeting, because a "word" usually meant 20 to 30 minutes of non-stop QRM of an S9 nature, which not

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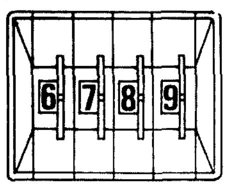

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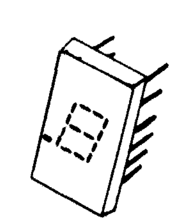

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only insulted our puritan amateur upbringings, but also had a tendency to dim our hopes for sneaking through that new HR-2B as a much-needed "replacement" for our broken dictating machine.

"It could be that he just wants to congratulate us for traffic control during the homecoming parade," said George, the group's president and resident hieroglyphys/regulations expert.

We all hopefully agreed, taking worried swigs out of our beer cans and busily conjuring up excuses for any misdeeds that we might be charged with – unjustly, of course.

The college President looked downright ill, his green face slightly resembling the average American's around income tax time.

"Sit down boys," he muttered in a one by one signal, "I've got a little problem that perhaps you can help me with."

"You're aware of course," the grim looking President continued, "that the ungodly art of streaking is becoming more and more of a major pastime on campuses across the nation. So far we've been lucky on this campus, mainly because most students are occupied with worthwhile pastimes, like you CB radio for instance. . ."

Now it was our turn to get ill.

"But, as of this evening," our President continued, "my office has been informed that certain subversive elements on this campus are planning the worst of all possible deeds – THEY'RE GOING TO STREAK THE MOTHER-DAUGHTER BANQUET!!!"

The President shuddered, his bald head glowing with the most acute resemblance to an overloaded LED readout. We thought he was going to keel over right on the spot, so we hurridly assured him that we would do our best to stop this planned SSB (suddenly streaked banquet) with images of a Heath gear dancing in our eyes.

Outside of our patriotic club duty to continue building that new 160m relay link verticle (come on now!), we spent every minute of our spare time during the next few days checking and re-checking our equipment and income tax forms, polishing our Standards, and preparing a master plan which we hoped would lay bare the facts

about the streaker plot before some 700 odd unsuspecting mothers got permanently squelched from heart attacks.

Genius George, in between cooking hot dogs in the final of his new 440 linear, managed to persuade a fellow streaker to rat on the guy who had plans for the banquet. All George did was merely promise the stoolie a nation-wide special on SSTV, providing that he streaked in slow motion. It was an easy matter for George to convince the prospective banquet streaker to wear a 2m rig and a ni-cad pack for decoration in addition to the traditional ski mask and tennis shoes. So it was an easy matter to keep track of his every movement through triangulation, and the rig got plenty of ventilation from streak to streak.

Needless to say, the streaker wasn't a licensed ham, but we easily got a couple co-ed members of our club to run along beside the "mobile station" and shout an ID into the mike every so often. They really didn't mind the effort, in the true amateur tradition.

They sold an awful lot more tickets to the Mother-Daughter banquet than they ever have before, or probably ever will, because word had gotten around that the event could become an SSB. That was the most alert audience listening to a boring after-dinner speech that you've ever seen (the topic was prevention of the common cold). Heck, we even had the event patched into the college's closed-circuit TV system, but chickened out at the last minute because our anti-streaker measures might fail and make some unsuspecting faculty member swallow his pipe.

Sure enough, just as the banquet speech was concluding, up the dining hall stairs into the banquet room came the FM toting streaker, running at full blast with the greatest of ease. But just as he reached the top of the stairs, word was passed through our trusty repeater, and George closed a relay that let go of the end of a "cocked" mobile 10m whip antenna. The poor streaker got it right on the back side of his beam, and he forgot all about the banquet, to this day never trusting a ham with the naked truth about anything, much less his rear panel.

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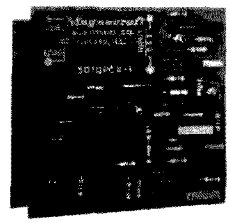

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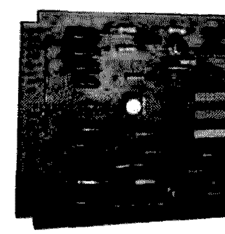

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AMSAT NEWS

Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

Launch of OSCAR 7 is still eminent, watch the 73 HOTLINE for up to the minute details.

The following is from the summary sheet on OSCAR 6. Presented at the IEE international conference held in New York on March 28, 1974.

In its first year and a half of operation, successful use of OSCAR 6 by 2000 amateur radio operators in some 75 countries and all 50 US states had been reported. Approximately 60% of the users have been outside the United States, including approximately 130 stations throughout the East European countries.

Operational Results

To date, New Zealand, Australia, Finland, France, Sweden and Czechoslovakia all have one percent or more of their amateur population using OSCAR 6 for two-way communications. In addition to these countries, West Germany, England, Japan, Canada, Italy, the United States, U.S.S.R. and Argentina each have 20 or more radio amateurs using the satellite. Together, these fourteen countries represent about 85% of the total user population, which numbers approximately 2,000 stations. For countries such as Angola, Austria, Bermuda, Iceland, Ireland and several others, OSCAR 6 has provided the first, and so far only, means for direct communications via satellite.

Amateur Satellite Education Program

The lifetime longevity of OSCAR 6 has made it possible to plan educational instruction programs with the satellite, using the spacecraft as a laboratory tool to demonstate physical principles and bring the student firsthand experience with satellite applications. With the assistance of the American Radio Relay League curriculum source material has been prepared by educators, showing teachers how to set up inexpensive OSCAR ground terminals in their classrooms and how to use them to teach their students space-age concepts such as Doppler measurement, orbit plotting, determining orbital period, communications range, and decoding and interpreting telemetry data.

ORBITAL INFORMATION

Orbit	Date (May)	Time (GMT)	Longitude of Eq. Crossing °W
7042	1	0101.3	63.1
7054	2	0001.2	48.1
7067	3	0056.2	61.8
7080	4	0151.1	75.5
7092	5	0051.0	60.5
7105	6	0146.0	74.3
7117	7	0045.9	59.2
7130	8	0140.8	73.0
7142	9	0040.8	58.0
7155	10	0135.7	71.7
7167	11	0035.6	56.7
7180	12	0130.6	70.4
7192	13	0030.5	55.4
7205	14	0125.4	69.1
7217	15	0025.4	54.1
7230	16	0120.3	67.8
7242	17	0020.2	52.8
7255	18	0115.1	66.6
7267	19	0015.1	51.5
7280	20	0110.0	65.3
7292	21	0009.9	50.3
7305	22	0104.9	64.0
7317	23	0004.8	49.0
7330	24	0059.7	62.7
7343	25	0154.7	76.5
7355	26	0054.6	61.4
7368	27	0149.5	75.2
7380	28	0049.5	60.2
7393	29	0144.4	73.9
7405	30	0044.3	58.9
7418	31	0139.3	72.6

WB8LBP

Con't from page 3.
intention of honoring this law, feeling that they are a law unto themselves. When it takes a court order to even see an IRS telephone book, then something is rotten.

And something is very, very rotten.

Fear of 73!

A letter from a reader in Phoenix tells me about some of the members of his club who are seemingly afraid to read 73 – afraid to let anyone know they read 73 – and in general up tight about the whole matter.

Wow!

He tells about a recent time when someone brought in some back issues of 73 to give away at a meeting and several of the members were so surrepticious in their interest in 73 that one might think it was banned literature.

This situation does exist in some places I guess – but it's sad to hear about it. Obviously it isn't the myriad of construction articles or the advertising that has so frightened these amateurs – it obviously has been my editorials. Fantastic!

Imagine it – I am able to write editorials that make people actually afraid to pick up the magazine. I might even feel proud of this if I had a better inkling of what things I've written about that have brought this on? Normally I would expect the mail to give me a good indication of such a violent reader response, but the fact is that letters and notes from the readers have been quite positive in backing my editorial stands. This in itself is unusual, for normally the people who get mad are the first to write and compliments are few and far between.

The fact is that I have often asked readers to take the time to sit down and put their ideas on paper and send them in. I believe that amateur radio needs one forum for ideas. . .and I think that 73 is the *only* such forum we have. The only reason that my ideas have been prominent is because there has been such a dearth of any other ideas. If anyone has any ideas or opinions, they have been pretty close with them.

Perhaps I should qualify that a mite, for there are some sources of strong opinions within the hobby, but they are characterized by rhetoric rather than substance, and are not very productive. I realize that I have an advantage over most amateurs in that I am so immersed in the hobby that I am able to get involved more than just about anyone else. Few amateurs have been able to go on DXpeditions – run up a substantial loss of countries worked – be involved in slow scan – with fast scan – with mobile FM – with their own repeaters – with RTTY – with nets – with rag chewing – with contests – getting to hamfests and conventions all over the country – and do this over a period of twenty some years. Few amateurs get letters from up to a hundred or so other amateurs a day – or read most of the club bulletins from all around the world (and there are hundreds of them). This does give me an unfair advantage in the broad sense – yet any individual amateur can easily become an expert in any particular aspect of the hobby and far outshine me in knowledge and accomplishments – and be a far better source of information on the League than I, even though I've known the top HQ people for many, many years – but have you ever seen even one director try to reach the amateurs outside of the framework of the League? I haven't.

It is curious.

The pages of 73 are wide open for ideas – and there is no requirement (nor has there ever been this requirement) that the ideas be acceptable to me or to the staff of 73. We do ask that they be reasoned and supported. If anyone has any good arguments against anything that I write about I wish they would let me know so I can pass along the information – and perhaps explain further my own ideas. Often I am much too brief in my

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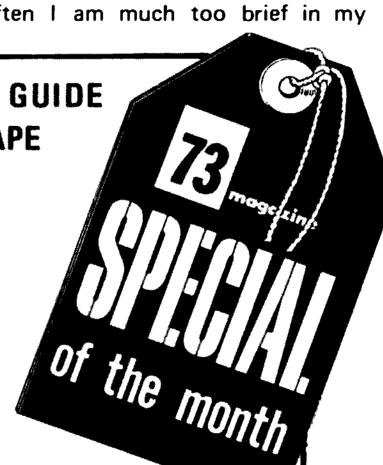

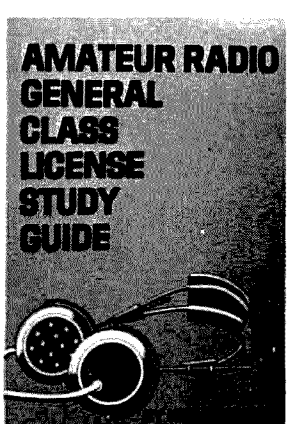

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explanations and this leads to misunderstanding. Outside of my attempts to reason with one official of the FCC, I have found there to be very few times when, with a little discussion, there was not a meeting of the minds and general agreement.

This is a challenge: the next time you find anyone who is afraid of 73 – see if you can find out why – and tell this chap that I challenge him to write to me with his specific disagreements – so we can see if they are that. What usually happens when someone who violently disagrees with me finally comes to face is that I try to find out what the disagreement is – and then try to explain either what it was that I really wrote or said (which is often a whole lot different from what people have heard that I have written or said) or I try to explain why it was that I wrote such a thing – with what background – then I listen to the other side and, if there is merit there, the chances are that I change my own ideas – it happens all the time.

One of the most common greetings I get at hamfests is, "I read your editorials and, while I don't agree with all of them, I enjoy them and they make me think." Nobody can be right 100% of the time – and since I am not nobody, it stands to reason that I will have a percentage of being wrong. I try to keep the percentage small, but when you think I'm wrong – take the time to write to me about it or call – and the chances are we will be able to come to an agreement.

Please do write. You are writing most of the magazine now. . .the articles and newspages. . .and I'll be happy if you, the reader, will write the editorials too so I can get in a few more hours of hamming. . .and perhaps a little DXpedition or two.

SPACE PROBE?

Recent articles in the National Enquirer have brought forth explanations of the long delayed echoes phenomena. This has been explored by some radio amateurs in the past and certainly needs further investigation. I recall some articles in QST on the subject in years gone by, but no satisfactory explanations.

The current idea is that these echoes are coming back from a satellite out there in space, possibly put there from some other galaxy as a means of communication. Experimenters have discovered that the pattern of echo delays can be plotted on a graph and the result is a reasonably accurate map of the stars in one part of the sky. Could this be an indication that this satellite is trying to tell us that this is its origination?

Several articles have been published recently on the subject and I wonder if there is a reader out there who would like to become custodian of progress reports on this line of investigation? I'll bet that there are a number of amateurs who would be interested in experimenting with this idea. We need to know what frequencies have been productive. . .what directions the echoes have been coming from. . .who has been working on the project. . .etc.

FCC NEWS

Reciprocal licensing, how's it doing? Just fine! The FCC issued 38 licenses to foreign visitors during January, with 11 of them going to Colombians, four to Nicaraguans three to Germans, G's and CE's, two to VKs, PYs, HBs and TIs, and one each for LU, CP, HI, HC 9K and SM. There's even a repeater licensed under this arrangement – DL2AA/W1 on 147.81-21 near Boston.

MAIL BY SATELLITE

Word from W4ATE is that a study is being made at the Marshall Space Flight Center in Huntsville for the U.S. Postal Service of a plan to move business mail by satellite. It's about time!

Practically speaking, though the current postage rates merely reflect the ravages of inflation. . .not having risen any more than most other things. . . with a two cent letter now running is it eight or ten cents?. . .it does seem odd that in this day of instant communication we still have to send a specific piece of paper in order to communicate.

It is time that some system be worked out, using satellite links or the ubiquitous telephone lines, or a combination of them, for semi-instant mail. Even the television cables might be used.

CASSETTE RECORDER BARGAIN

Several readers who have invested in the cassette recorder being offered with the Morse code cassette courses have written or called to tell us that this exact same recorder is being offered in their locality for $44.50 or more. They wonder how we can sell this for only $23.95. The fact is that when you buy recorders directly from the importer in large quantities and pass them along at virtually our cost, the price is kept remarkably low. We're not in the tape recorder business – we only want to make sure that our readers have a good cassette recorder to use with their code cassettes so they can get their ham licenses.

KEEP THOSE CARDS AND LETTERS COMING

Yes indeedy, when you see something about amateur radio in your newspaper or in a magazine get out the scissors and clip it out for us here at 73. We're always on the watch for items of value for the 73 newspages, for showings to congress, and we like to paste things into scrap books. We particularly want to thank all the readers who sent in the stuff about illegal use of CB for truck blockades. . .that sort of stuff helps in little battles like trying to save 220 MHz.

W2NSD/1

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you are interested, send *73* your name, address and phone number. Don't be bashful – remember, it's always easier when you have someone to give you that added bit of confidence.

73 would appreciate amateurs and clubs looking this list over and helping whoever they can. Do you remember when you needed help?

Jerry L. Smith Sr.
29 Toth Avenue
Coatesville PA 19320

James Eller
4784 Clyde Road
Howell MI 48843
517-546-4103

Thomas Beaudry
364 Clay Street
Sparta MI 49345

Lyle Fisher
R. R. 1, Box 104
Cook NE 68329
402-864-4525

SP/4 C. E. Bailey
546-90-3709
HHC 708th Mt. Bn.
APO 09034
Baumholder, Germany

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Aprinofield MO 65802
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$\boxed{5}$	6	7	8	9	10	11
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$\boxed{19}$	20	21	22	$\boxed{23}$	$\boxed{24}$	$\boxed{25}$
26	27	28	29	30	31	

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	7	7	7	7A
ARGENTINA	14	14	14	7A	7	7	14	14	14A	21	21	14A
AUSTRALIA	14	14	7B	7B	7B	7	7	7	7	7	14	14
CANAL ZONE	14	14	7A	7	7	7	7	14	14	14	14	14A
ENGLAND	7	7	7	7	7	7	14	14	14	14	14	14
HAWAII	14	14	7B	7B	7	7	7	7	7A	14	14	14
INDIA	7	7B	7B	7B	7B	7B	14	14	14	14	14	7
JAPAN	14	7B	7B	7	7	7	7	7	7	7	7A	14
MEXICO	14	14	7	7	7	7	7	7A	14	14	14	14
PHILIPPINES	14	14	7B	7B	7B	7B	7B	7	7	7	7A	14
PUERTO RICO	14	7	7	7	7	7	7	7	14	14	14	14
SOUTH AFRICA	7B	7	3A	7	7B	7B	14	14	14	21	14	7B
U. S. S. R.	7	7	7	7	7	7	7A	14	14	14	14	7
WEST COAST	14	14	7A	7	7	7	7	7A	14	14	14	14

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7	7	7	14
ARGENTINA	14	14	14	7A	7	7	14	14	14	14	21	21
AUSTRALIA	14	14	14	7B	7B	7	7	7	7	7	14	14
CANAL ZONE	14A	14	14	7	7	7	7	14	14	14	14	14
ENGLAND	7	7	7	7	7	7	7	7	14	14	14	14
HAWAII	14	14	14	7B	7	7	7	7	14	14	14	14
INDIA	7	7B	7B	7B	7B	7B	7B	7B	14	14	7	7
JAPAN	14	14	14	7B	7	7	7	7	7	7	7A	14
MEXICO	14	14	7	7	7	7	7	7	7	7A	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	7	7	7	7A	14
PUERTO RICO	14	14	7	7	7	7	14	14	14	14	14	14
SOUTH AFRICA	7B	7	3A	7	7B	7B	14	14	14	14	14	7B
U. S. S. R.	7	7	7	7	7	7	7	7	7	7A	14	7

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7A	14	7A	7	7	7	7	7	7	7	7	7
ARGENTINA	21	14	14	7	7	7	7	14	14	14	14A	21
AUSTRALIA	21	21	21	14	14	7A	7	7	7	7	14	14A
CANAL ZONE	14A	14	14	7	7	7	7	14	14	14	14	14
ENGLAND	7B	7B	7	7	7	7	7B	7B	7B	7B	14	14
HAWAII	14A	21	14	14	14	7	7	7	14	14	14	14
INDIA	14	14	14	7B	7B	7B	7B	7B	7	7	7	7
JAPAN	14	14	14	14	7	7	7	7	7	7	7A	14
MEXICO	14	14	14	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	14	7B	7B	7B	7	7	7	7A	14
PUERTO RICO	14	14	7A	7	7	7	7	14	14	14	14	14
SOUTH AFRICA	7B	7B	3A	7	7B	7B	7B	7B	7B	14	14	14
U. S. S. R.	7	7	7	7	7	7	7	7	7A	7A	7	7
EAST COAST	14	14	7A	7	7	7	7	7A	14	14	14	14

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

73 magazine

for radio amateurs

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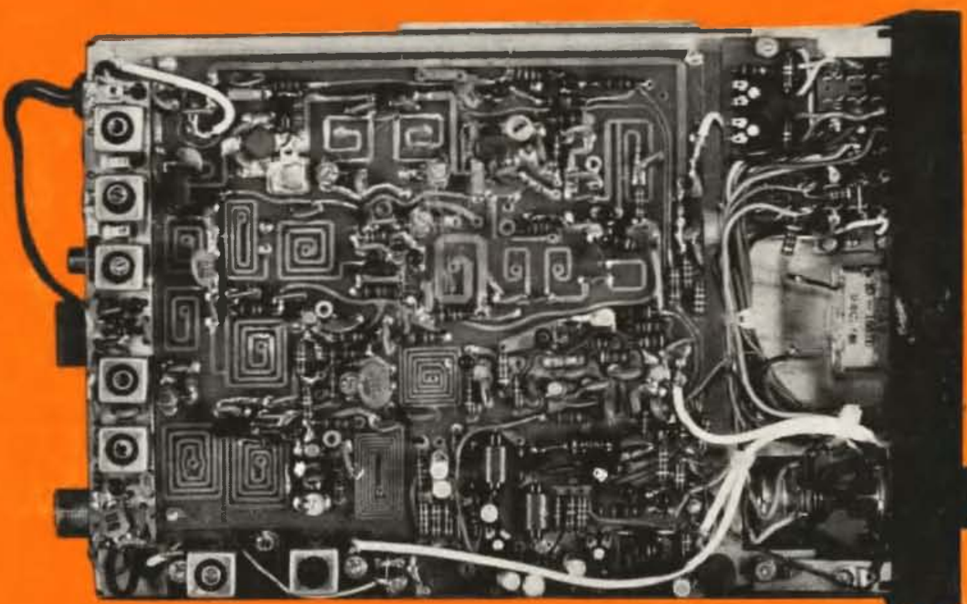
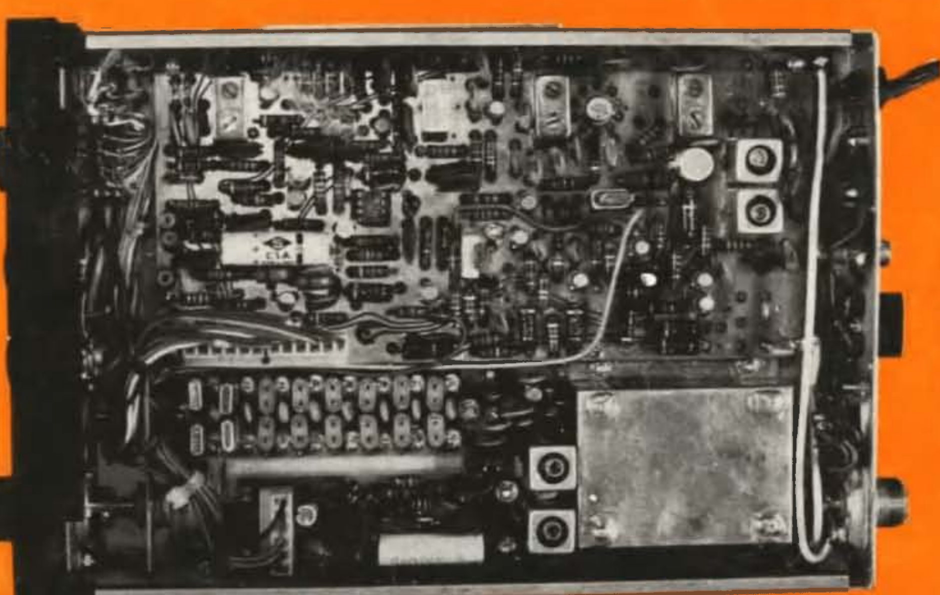
JUNE 1974





73 magazine
for radio amateurs

165 JUNE 1974

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CONTENTS

COVER: *The new TPL-220 transceiver — shown at Dayton — has a tunable receiver in addition to crystal FM channels so you can tune the whole band. More and more 220 gear is being made available. Perhaps, with the 220 CB deal a dying, the manufacturers will help us get the band going for amateurs?*

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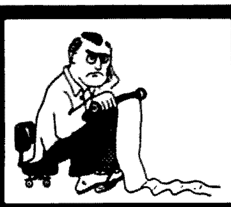


NEVER SAY DIE

...de W2NSD/1

EDITORIAL BY WAYNE GREEN

GREEN VS IRS

While my complaints about the IRS in the past issues of 73 have been raised mostly on the basis of what they have done to a lot of other people and what powers they have, as well as how this can affect you and what you might do about it, the fact is that the IRS has been working diligently on me – and with some success.

Samuelson said in his interview in Playboy (whether you like the pictures or not, it is one of the few magazines powerful enough to be able to speak out against the IRS) that the IRS can, if it wants, convict anyone of criminal fraud on the basis of their tax returns. I can testify that he was not exaggerating.

Readers who dislike my carping, pushing and shoving the ARRL, the FCC and other such seemingly immovable objects, while taking delight in my problems, will ask why I should air my personal troubles in the magazine and thus offend them. The answer is simple – what happened to me was no more personal than polio or cancer – it can (and does) happen to anyone. It *is* something to be concerned about.

Readers who are able to look at the long run – the things that I have helped to get changed down through the years as a result of my needling and bitching – know that I am not without some effect, in spite of my irritating way of going about things. In my defense on this I would point out that no one in history who has tried to change things was very popular – not to draw a comparison, but look what they did to Christ. There have been a lot of martyrs in history, but this editorial happened to be written on Easter Sunday and the thought was fresh in mind.

ON TRIAL

The indictment which was handed down by a grand jury said that I was accused of knowingly having the tax returns for 73 Magazine and myself prepared falsely for the years of 1966-67-68. Since this was completely untrue, it seemed like a problem that would eventually get cleared up when light could be shed on it.

Three years of tax returns for 73, three for me, came to six counts on the indictment – plus six more counts for my signing the returns – that little line on the bottom which says under penalty of perjury – a total of twelve counts.

Those of you who have watched the Perry Mason series are familiar with the thinking of the prosecution – they want a conviction, whether the accused is guilty or not and they get furious when Perry is able to show that the accused is innocent. The actual innocence of their victim is of no consequence, only their need for a conviction is paramount.

What you don't see in Perry Mason is the back stage maneuvering of the government to win the case. They try to hide as much of their case as they can so the defendant will have a minimum of opportunity to prepare to argue or counter the evidence or testimony. In our case they had a list of over 200 witnesses which they withheld as long as they could to make sure that there was no possible way to do much about it. Their use of out of date addresses for many of the witnesses was an added obstacle.

Since they only used about a dozen of these 200 plus witnesses, it is rather obvious that this was an attempt to hide the real witnesses among a crowd of psuedo-witnesses to prevent any defense being worked up.

Even with all this I didn't worry exceedingly about the situation because I was sure that justice would be done, that the facts would have to come out in court. They did, but they were so obscured by trivia and massive amounts of irrelevant things, that they got lost in the shuffle.

Would you go into court as a defendant, knowing you are up against the very best lawyers the government can afford, brought in from Washington to do a job on you, and with you defended by a lawyer who has never tried a case before? You would if you were in my place and found that the mere indictment had cut off your credit so you had no money to pay an experienced trial lawyer – not even enough to have a second lawyer just sit and help with the paperwork during the trial.

Just as an added hurdle, let's make your lawyer an accountant with a small one-man office and a bunch of clients who need their tax returns prepared during the first three and a half months of the year – and let's put that trial at the worst possible time during that work period. Thus, he will not only have to work all day in court defending you, but will then have to work nights on his regular business instead of preparing for the next day's court action.

Would *you* expect a fair trial?

THE PROBLEMS

For the last twenty years I have had my tax returns prepared by accountants. I know only enough about taxes to know that there is no way for anyone but an expert to understand them, so I turn to professionals. My "professional" (General Business Services) for the years 1966-67 let me down and the IRS jumped in with glee to take advantage of the situation.

During those years I had little to do with the financial end of the magazine. We had a business manager and he took care of all that. I depended on the accountant to make sure that any personal expenses paid by the magazine would be charged to me and all checks spent were clearly marked as to their purpose to simplify this. Nothing was hidden or obscured. Starting with some of these expenses which the accountant did not properly allocate, and then adding an unbelievable number of "disallowed" expenses, the IRS built up a formidable figure for taxes. Each disallowed expense counted twice, of course, once as unreported income for me personally and once as unreported income for the magazine, so this doubled each disallowed expense.

What sort of items did the IRS disallow? In my office they disallowed my desk, a chest, the paintings on the walls, the chairs, tables, lamps. They disallowed the decorations in the reception room, the table and chairs in the lunchroom, and many other pieces of office furniture – lamps – tables – chairs. Then add to that the expenses on trips to hamfests and conventions where I have given talks and sold subscriptions – total disallowance of DXpedition expenses – cameras – books and magazines for research – all car repairs, licensing, purchase costs, even for cars used strictly by the magazine – ad sales trips – interview trips for new editors – entertainment of visiting hams, advertisers and dignitaries – and you end up with a formidable list – times two.

The trial lasted almost a month and during that time there was never one word of testimony that I falsified my records, that I hid anything, that I tried to deceive the accountants, that there was any double bookkeeping, or anything that I did was wrong. The accountants all testified that I did not try to influence them when it came to

business vs personal expenses and that I accepted their decision without complaint.

Some of the expenses involved were indeed personal — many were in what the accountants call the gray area — where accountants and the IRS get together and haggle — and many were very clearly and obviously business expenses. It should be mentioned that the IRS did not make any effort to even find out what most of the disallowed expenses were. They went by what was written on the check and asked few questions. And some of the disallowed expenses were things which had been allowed by an IRS audit in a previous year!

My lawyer pointed out that if he could get one businessman on the jury we would have no problem. No way. The jury was mostly retired people, housewives and a couple of blue collar workers. They were as lost as I was during all of the obscure accounting and tax talk and they ended up voting, I suspect, on the basis of the closing statement of the prosecutor, which was masterful. My lawyer took a few minutes to point out that there had not been a shred of evidence produced during the long trial that I was guilty of anything except hiring a lousy accountant. The prosecutor took well over an hour to dwell on the indictment and the massive amount of disallowed expenses.

It didn't help a lot that I managed to get the flu half way through the trial and had to sit there day after day, with a fever of 102 or so, shivering with chills, unable to really be aware of what was happening. In ten days I lost 15 pounds and was so weak I could just barely walk — this, of course, was when I was called upon to testify. I have little recollection of it.

In retrospect I understand how foolish I was to trust the IRS. I thought that if I was honest with them that we could solve the few problems we had with the taxes. I didn't realize that they are desperate for goats to parade at tax time to frighten taxpayers into compliance. My case was complex enough to be made to order for them. I should never have cooperated with them — shown them our records — for I'm now convinced that they were interested in a fraud conviction right from the first and pretended to be interested in a civil audit just to pick out items which might convince a jury.

WHAT NEXT?

The decision of the court is not yet known in the case, so it is still premature to say that I have been convicted of tax evasion. Whether I am convicted or not I will do everything I can to help keep other people from getting into the same position. I now know personally that it can indeed happen to anyone.

You are undoubtedly familiar with the frustration of being accused of something you didn't do. It is infuriating. You want to do something about it when someone lies or distorts things, yet under the trial system you have to sit there and grind your teeth. I'd love to publish the transcript of the trial, but that is over 3000 pages! No wonder the jury fell asleep. Unless the court stops me, I do want to cover the essential points of the trial — the story developed by the IRS — and the story they so successfully covered up. Knowing that most juries work on the "where there's smoke there must be fire" principle, the IRS generated an almost inpenetrable smoke screen.

If the court does convict me we will appeal and try to do better next time. In view of the total lack of evidence that I did anything wrong, it is possible that there will be no conviction.

DO YOU WRITE

If there is anyone out there who has been working with Novices a lot and has an understanding of what information they need — and who is able to write coherently — there is a possibility that a relatively short Novice column in 73 might be well received. Any takers?

There is also a rather continuing need for research articles for 73 — things that you might suppose would be done by the 73 staff — if there were that much of a 73 staff. About once a year or perhaps every other year the readers would like to have a survey of the equipment available for a particular band or a particular mode. For instance, an article on all of the 220 MHz gear available, including any specific accessories. Or one on 12vdc power supplies. Or one on 6m ham gear. 450 gear. Test equipment for the ham shack. Two meters would have to be split up a bit — hand units — mobile and fixed station units — power amplifiers — antennas. Low band sideband gear. 160m gear. You get the picture. It means getting the latest information from manufacturers, pictures, making up charts of comparison, and providing a brief review of each unit. . .etc. It pays.

TO CB OR NOT TO CB

A call from a friendly eastern FCC inspector explained some of the working of his organization. When calling on licensed CBers he has the authority to levy a fine on them for breaking the rules. When the CBer is unlicensed he can just warn them and then, if they continue, go to a U.S. magistrate, file a complaint of violation of the Communications Act and apply for a search, seizure and arrest warrant. He can then get a U.S. marshall to accompany him and to execute the warrant.

Amateurs who have CB neighbors who are operating illegally must wrestle with their conscience about calling the FCC. Is it better to turn in an illegal operator and perhaps get rid of a lot of local TVI and bad will towards amateurs, or just keep quiet and thus be a party to the lawbreaking? Silence is assent. If you don't do anything about it, you are guilty.

MORE NEWS REPORTS NEEDED

Radio amateurs have been performing emergency services in recent months as never before. While it is important to see that news of this service reaches your local papers, always remember that other amateurs will want to know what you've done too, so be sure to either send a copy of the news clipping to 73 or send in a brief writeup of the service to the magazine. Pictures of the people involved are also helpful, if they are available or can be taken, either in group or solo. The deadline for newspage material is the 15th of the month.

While some congressmen may get to see your newspaper articles, most of them won't. Only 73 sends copies of important amateur news from the newspages to congress. The FCC will get to see them this way too.

Long, detailed articles on emergency service normally should go to QST, while briefer reports should be aimed at 73.

HOTLINE COOKING

The HOTLINE, a ham newsletter sent out by first class mail every other Friday, is drawing bravos from all over. It covers all the late breaking news — the latest FCC reports — the hamfest news — contest news — jobs open in the industry — DX late news — new equipment announced — new books — propagation flash — repeater update — so why wait two months for these items to reach you through 73 Magazine. Get the inside scoop while it is still news. It'll make your contacts a lot more interesting. All this for only $8 per year sent first class — and that reaches most places as fast as airmail — and some places it reaches faster.

NEW FCC FORM

Repeater groups who have been asking about their license applications have been receiving a new FCC form from Walker. This form announces that they've lost the application, so please do it again.

W2NSD/1

SSTV SCENE

Dave Ingram K4TWJ
Rte. 11, Box 499, Eastwood Vil. 50N
Birmingham AL 35210

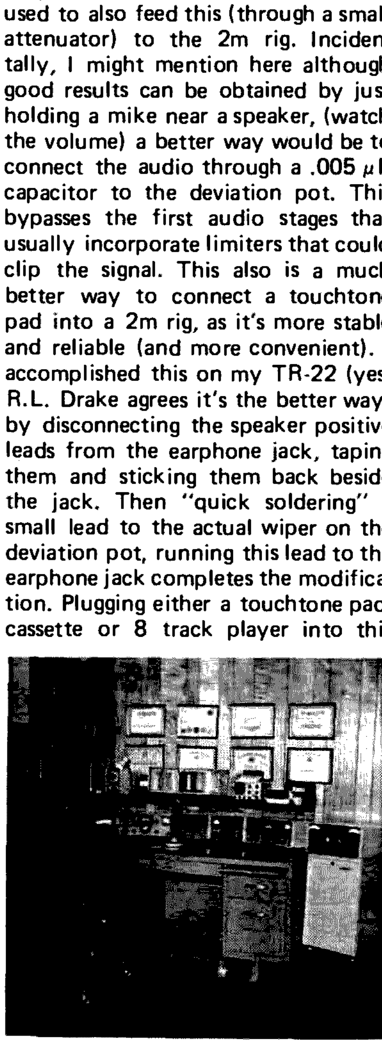
UNITED STATES RESULTS
4TH SSTV CONTEST

CALL	QSOs	CONTINENTS	BAND/ COUNTRIES	TOTAL POINTS
W9NTP	82	6	42	9348
WA7QBV	43	3	56	5334
WA1NXR	44	4	31	3608
WB4ECE	43	4	33	2279
WA1KYW	33	4	21	2046
K9BTU	16	3	10	560

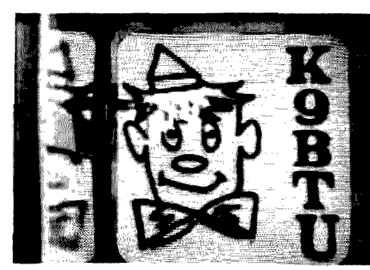
This year's Slow Scan contest appeared a fine success, and I'm sure all of you enjoyed it. As of this writing date, I have tallied U.S. results, (see Chart 1) and am standing by for world results from Franco I1LCF. I understand some of the U.S. stations sent their logs directly to Franco (rather than either sending me a copy, or having me forward them to Franco, as I mentioned in the January column) so the final tally was from received information.

Don Miller W9NTP, was the winner with a rather impressive score which included WAC on SSTV. Next was Bob WA7MOV, and Connie WA1NXR, both who are quite active on Slow Scan. Although everyone agreed conditions were anything but optimum, it's interesting to note East Coast stations reported fair openings into (primarily) Europe, while West Coast stations reported fair openings into (primarily) the South Pacific and Asia area. "Centrally located" stations appeared to have the advantage of catching both areas. Like most contests, this one also had its points of interest. WB4ECE reported "being tied up with business 'phone calls most of the time." K9BTU had his Ham-M Rotor give up, leaving the beam stuck on Europe, plus taking time out to attend a wedding. WA1NXR operated the contest without AGC action on her TR-4 (Boy, I bet that was good on the ears!) only to have the rig go out completely right after the contest. Quite a few of the gang reported falling asleep at their rig during the wee AM hours. AhAh. . .the pleasures of the chase. Our thanks to all for your comments and pictures. Naturally next year will be even better!

Slow Scan on 2m appears to be growing in popularity, probably because it is handy in checking ideas and circuits with others under "closed circuit" conditions. (Just watch deviation – present regs call for this to be low). In some circumstances this could prove advantageous. One could "show" a problem to another local SSTVer, even while driving to work. That's as simple as remembering to grab the cassette unit on your way out. Newcomers could check out and get familiar with Slow Scan gear by taping these QRM free pictures also. (Again, just a cassette recorder in the car is all that's necessary.) No "tuning for proper syncing" is required on FM. In fact, a simple PLL circuit could be built which would energize the recorder while Slow Scan was being received, thus a "no hands" operation could be accomplished. I have found a two cartridge system works best. . .one for recording and one for transmitting. The "Program" is recorded on both "sides" (directions) of one cartridge, so I needn't worry about rewinding. Then, when receiving SSTV, I just swap cartridges. I also often use my car's 8 track stereo tape deck for Slow Scan. One of my "home recorded tapes" has a SSTV ID on one track's left channel output and a SSTV program on the right channel output. Simple switching circuits are used to also feed this (through a small attenuator) to the 2m rig. Incidentally, I might mention here although good results can be obtained by just holding a mike near a speaker, (watch the volume) a better way would be to connect the audio through a .005 μF capacitor to the deviation pot. This bypasses the first audio stages that usually incorporate limiters that could clip the signal. This also is a much better way to connect a touchtone pad into a 2m rig, as it's more stable and reliable (and more convenient). I accomplished this on my TR-22 (yes, R.L. Drake agrees it's the better way) by disconnecting the speaker positive leads from the earphone jack, taping them and sticking them back beside the jack. Then "quick soldering" a small lead to the actual wiper on the deviation pot, running this lead to the earphone jack completes the modification. Plugging either a touchtone pad, cassette or 8 track player into this jack (watch that level) gives double capability. I can even talk low into the mike during SSTV transmission for mixed audio and video. Slow Scan transmissions on 2m can be kept very short since there is no QRM. A single frame can be spliced into a tape loop and replayed indefinitely. And if you would like a good antenna for SSTV especially try the New-Tronics CGT-144 – 5.2dB gain job. It really helps me from the car. I feel SSTV on 2m is good for experimenting (watch that deviation!) but would defeat its basic purpose (that of long distance TV communication) if used for 20m style QSOs. 440 MHz Fast Scan would be better suited for that purpose. However, pulse modulation SSTV for moonbounce might be a worthwhile consideration. (Let's see you beat that 262dB path loss!)



The K9BTU SSTV Setup



K9BTU Transmission

Ralph ZL2AAV, should have received his Robot monitor by now, so watch for him around 14.230 kHz. He has some interesting taped programs that show active volcanoes, crater lakes and ski slopes in his area. In fact, Ralph has been quite busy on a sampling camera that might be working by now. Bill XW8DO, reports being back on 2m and looking for SSTV QSOs mainly on Tuesday and Wednesdays (approx. 1400 GMT) and Saturdays (around 0100 GMT). Joseph WA2ZDF/CP1, is busy finishing his new 'MXV monitor and should be on 20m soon, at least with some taped programs while he builds a plumbicon camera.

Next month I plan to have world results of the Slow Scan contest, a recap of the Dayton bash, and much more. 'Till then,

K4TWJ

LETTERS

COUNSEL FOR THE TAXPAYER

Internal Revenue Service officials have assured congress that IRS employees do their best to comply with the letter and spirit of the Freedom of Information Act, now in its eighth year of operation. Do they?

No. I'm sorry to report that they're still flaunting the law despite repeated warnings from Capitol Hill. Eloquent proof is found in the results of a recent survey of nine IRS district offices. The inquiry was made by representatives of Freedom, a journal of national circulation published by the Church of Scientology.

Reverend Kenneth J. Whitman, Freedom's editor, authorized the survey after examining instructions that all IRS employees are supposed to be following. They're contained in an IRS manual supplement entitled "Release of IRS and Other Telephone Directories to the Public."

This manual was distributed by the IRS national office to all IRS district offices. In accordance with the FoI Act, it clearly states that IRS district telephone directories are to be made available to the public on request.

Certainly there's nothing hush-hush about a mere list of employees, with their office telephone numbers. I keep one in my desk that covers the entire IRS national office, as well as other listings. This directory can be obtained at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Yet Freedom representatives were allowed a look-see at district office directories in only three out of nine cities: St. Paul, Detroit and Portland OR. They were summarily turned down in Los Angeles, Honolulu, San Francisco, St. Louis, Boston and Austin TX, after receiving the third degree in each office.

Whitman said the results lend great weight to the charge, frequently heard, that IRS operates like a secret police organization.

Portland was the most cooperative office. But even there, the inquirer was interrogated before being allowed a peek at the directory.

Apparently it was only by luck that the Freedom requester was successful in St. Paul. The IRS employee who handed over the directory said, "Here you go. Monday is my last day anyway."

Freedom got a chilly reception in San Francisco. An IRS public servant said, "I wouldn't know why you would want a directory except to spread propaganda." IRS spends millions of tax dollars every year to spread its own propaganda from the Atlantic to the Pacific.

When turned down in Austin, the Freedom representative asked if there was any way to get a directory. Answer: "No."

Freedom pollsters really got the run-around in Los Angeles and Honolulu. The inquirer in L.A. was told that he'd have to write to the district director and state exactly why he wanted to see a directory!

In Honolulu, an IRS official said the directory wasn't available to the general public. It was only for inter-office use, he said. The Freedom man was asked what company he was with, who he represented, what he wanted to use the directory for and how he came to know there was such a telephone book.

Reverent Whitman's conclusion: If you want to know how IRS really operates, watch what it does, not what it says it does.

E. Edward Stephens
Third Floor
815 King St.
Alexandria VA 22314

IRS – BAH!

I am in complete agreement with you on your stance on the blood-sucking Infernal Revenue Service.

You want to do away with the income tax? It is a very simple matter, according to the Constitution of the United States, which has been used as toilet paper up till now by the Nixon administration. The First Amendment to the Constitution says: "Congress shall make no law respecting an establishment of religion. . ." Yet, the church in this country is free from the burden of paying its fair share of taxes. It does business in this country via owning railroads, buildings, houses and bingo halls. It makes hundreds of millions of dollars per year. It has billions of dollars in real estate and priceless jewelry and gems. All untaxed! If this is constitutional then I am the Statue of Liberty.

In Mr. Green's editorial, in the April issue, he states, "The IRS has no right to see your records, cancelled checks, etc. without a court order. . ." I am very sorry to say, Mr. Green, that the Nixon court (formerly the Supreme Court), has just this week, declared constitutional, the 'right' of the government to examine any and all financial transactions, checks written, etc. without a court order. All banks must now keep a microfilmed record of all activity in your bank accounts, and make them available at the government's request. Of course, the stooges appointed to the high bench by Nixon, voted for this.

Name Withheld
Flushing NY 11352

HOW TO MAKE $100

Received the April copy of 73 this evening. Could hardly wait for dinner to be over so I could get started reading. Imagine my surprise when I read the article entitled "The New Breed On 2 Meter FM."

No foolin Wayne, the same thing happened to me about 2 weeks ago. I drove into a service station to have my car serviced. Naturally the attendant noticed my call sign in the back window and the bumper mounted antenna. Some one had told him there was a 2m repeater hookup nationwide, and he has a licensed brother in Oregon. The attendant knows the code but not the theory. If he had a license he figured he could talk to his brother.

When I told him I got an advanced license about three years ago he says, you ought to be pretty good, and if I would take the exam for him, he would give me $100.

Boy oh boy!

George A. Lewis W7SBZ
Mesa AZ 85202

RECTANGULAR PEG IN A ROUND HOLE

Do you sometimes want to chassis mount an IC in a round can? Here's my solution: Use the bottom side of a tube socket as a round terminal strip on which to mount the IC. No large hole is made in the chassis; only those for the mounting screws. Flat wafer type sockets work best. For example, suppose you want to mount an 8-pin, TO-5 IC. I suggest a 7-pin, miniature socket. Obviously you will have one pin left over on the IC. Look at the IC diagram — almost always at least one pin is a "no connection." Make that the "extra" pin. Cut the lead short or at least make sure it doesn't touch anything.

There is one fly in this ointment. Some ICs are unstable with leads this long. However, the popular self-compensated operational amplifiers (such as a 741C) are completely stable. Try to keep all output wires from getting close to the + or non-invert input.

The IC can be soldered in either right side up or upside down (looking at the bottom of the tube socket), but make damned sure you know which pin is which. If an octal socket is used, the upside down way will mean that the IC will fit neatly into the hole in the middle of the socket! However, be careful here as some ICs have power supply connections to the can — the IC might touch the chassis through the hole and short out.

Clyde E. Wade, Jr.
Little Rock AK 72205

MORE RECEIVER INFORMATION RECEIVED

Thank you for publishing "How The Communications Receiver Began," March 1974. Truly a refreshing look at the great beginnings of radio communications, with most of the contributions by active "hams."

Concerning National Company and the justly famous HRO. Two names deserve special mention: James Millen W1HRX and Dana Bacon W1BZR. The precise division of labor at National is a bit unclear, but I know that Millen was by training a mechanical engineer and was responsible for the National line of "Velvet Vernier" dials and also the entire PW series used on HRO and other receivers.

Rumor once had it that Millen vacated National to form a company in his own name because someone insisted that the HRO be redesigned into a prettier radio, with bandswitching and a direct-reading dial. The HRO continued unchanged!

The correct name is McMurdo Silver – not McCurdo Silver! I believe that McMurdo Silver won international competitions with his receiver designs a number of times, and that his sets were chosen for use on Arctic expeditions as being the best available.

A final addendum: Hallicrafter DD-1, a real brute of a receiver! This was a dual-diversity receiver consisting essentially of two separate SX-28's connected to independent antennas with automatic sampling to choose the stronger signal and feed it to the common audio system.

B. van Sutphin
St. Petersburg FL 33701

TAPE GREAT STUDY GUIDE GREAT

Fantastic! Both the code tape and the Extra Class study guide!! The tape enabled us to bring our code speed to 22 WPM in short order, while the guide. . .well, it was just about the most lucid text I've ever read. It has been said that good writing is transparent; that is, with good writing, the reader never stops to think, "Now, isn't that a cute way of presenting this or that." But the guide *IS* well written and many times I found myself stopping to observe how well a particular point was made, or how something that I really never had a good feeling for was suddenly crystal clear! That I passed the Extra Class exam today on the first go around is due in no small way to the tape and guide you supplied!

Ted Cohen
Alexandria VA 22308

WRETCHED SUCCESS

A pleasant surprise to see wretched Coward writing again in 73. I had wondered where he was hiding out. Seriously, the warning about "license consultants" was well taken. All I can say is nix on that type of activity!

J. R. Johnson WA5RON
Austin TX 78751

$9 – OUTRAGEOUS

While Wayne Green is hassling with the FCC perhaps he could shame them into reducing the fee for re-application for the Ham license. I think nine bucks is outrageous; when I was a lad in the early teens (years on the calendar that is) it cost nothing for a ticket and Uncle Sam issued the ham and commercial call books for a very nominal sum, a buck I recollect. Now we are supporting a bureaucracy which is not doing the job.

Christopher Noble Ex/W6HEC
Comdr. USN Ret.
Durham NC 27707

CIRCUIT CORRECTION

Your feature column on Circuits is great – provides the experimenter with many useful ideas. But the one circuit shown on page 34 of the April 1974 issue scares the H--- out of me and it is no April fools joke either. Of course I am referring to the line operated audio power amplifier.

As it is shown, the common side of the input can be riding directly connected to the hot side of the AC power line. And this condition is true as long as the unit is plugged in, whether or not the power switch is on or off. The only way to use this with safety would be through an isolation transformer. It could be used with a three terminal plug and making sure that the grounded side of the AC line is the one connected to the common return line of the circuit. But even this is risky unless the user checks the outlet he uses to make sure the electrician didn't make the wrong connection in the outlet box.

Harley Gabrielson K6DS
La Mesa CA 92041

DQ

Re: *Sexton's Laws* (March 1974). Mr. Sexton neglected to mention the means of estimating the complexity of any amateur project. This is the DQ, or "dammit quotient," and it indicates the number of dammits required to complete a project. The more complicated the project, the higher the DQ.

Full credit for discovering this handy measuring unit must go to my husband, Bill Hood W2FEZ, who employed it for years before becoming fully aware of its utilitarian potential.

Barbara Hood
Albion NY 14411

INFORMATION PLEASE?

I live in a small cottage in an industrial park. The back of my house is up against a large concrete-steel reinforced building. Lots of electrical QRN and high powerlines all over. I can't have an outside antenna, so I must use an indoor one. If anyone has any suggestions or designs I'd appreciate hearing about them.

P. Cook WA7CSK
Phone: 762-0358
218½ S. Findlay St.
Seattle WA 98108

TWA SERVES?

I haven't noticed any answer to the "TWA Serves" and "What am I Eating?" published a few issues ago. My wife says the "TWA Serves" is a type of Coffee Creamer and "What am I eating?" is another brand of the same thing. (Right. . .ed.)

This is just another example of today's advanced technology. If that makes you wonder what you are eating, look up what our convenient "processed" cheese is made of. A very good book which covers this field is "Consumer Beware" by Beatrice Trum Hunter. But if you read it, beware – you may want to stop eating things you accept as everyday food.

Happy reading and EATING.

Bob MacArthur
Penticton BC Canada

XU1AA WHERE OH WHERE!

I have received the following note from Bill Spencer KA6WS, relative to problems with the lost XU1AA logs. Bill offers the following aid:

"All USA and other stations working with XU1AA who was MC on prearranged skeds with XU1AA, be advised that the logs of XU1AA for June through September 1973, have been lost. When, and only when, KA6WS acted as MC he maintained a copy of the logs. To obtain a QSL, send complete QSO information and SASE to: Bill Spencer KA6WS, P.O. Box 128 MCAS (H), F.P.O., Seattle WA 98772.

Bill is not acting as the general QSL manager for XU1AA, he is only offering to confirm those QSO's for people who checked in through him for an XU1AA QSO.

Ed Moody W3GID
Furlong PA

AUTHOR HINTS

Many times your construction articles appear to be "just what the doctor ordered." Regretfully, some projects meet an untimely end. Why? Because:

(1) The author has access to a line of experimental or limited run devices from a "friend" employed by the manufacturer.

(2) The particular project involves a key device with a $40 price tag and said project needs six of them.

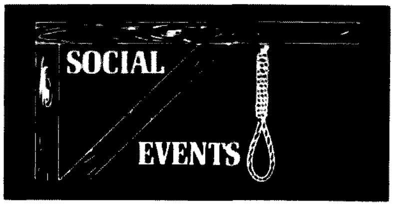
I would like to see all authors make note of limited availability devices and include a cost estimate based on major components (Tubes, ICs, diodes, transistors, etc.,).

Tom Valosin WB2KLD
Middleburgh NY 12122

NOVICE NET

Is there anyone that could tell me if there is a net in any of the novice bands? Thank you!

Joel Craig WN6WKQ
308 Shamrock Dr.
Ventura CA 93003



PENN-CENTRAL HAMFEST

The Williamsport and Milton Club's 11th Annual Penn-Central Hamfest will be held Sunday, June 2, at the Union Township Volunteer Fire-grounds on Route 15 in Winfield PA. Indoor and outdoor facilities for contests, auction, and fleamarket. Starting at noon, gate registration $3, free parking. Talk-in on 3940, 146.52, and 146.94. More information available from Clair Yeagle WA3QXI, 714 N. Main, Watsontown PA or call (717) 538-9292.

MISSOURI SINGLES

The Missouri Single Side Band Net will have their annual picnic at Memorial Park in Jefferson City MO, Sunday June 9. A covered dish dinner will be served at 12:30. Coffee, ice tea and soft drinks will be provided by the net. Door prizes given. All amateurs, their families and friends are invited.

POMONA FEST

The Tri-County Amateur Radio Association will hold a field day celebration on June 23 and 24, at the Water Department Filtration Plant in Claremont CA. General Dynamics ARC and our club will join forces.

On August 4th, we will have our hamfest picnic at Westmont Park in Pomona CA. Drawings for prizes and gifts. For more information contact: John Goodreau, P.O. Box 142, Pomona CA 91769.

SEE YOU IN DES MOINES

2nd Annual Des Moines Hawkeye Hamfest will be held on Sunday, June 16, 1974, at the Iowa State Fair-grounds. Plenty of free parking. Fleamarket, covered display booths available, small charge; open arena, no charge. Dealer displays, prizes, and expanded XYL activities. Saturday night auto races and camping-extra. Registration $1.50 advance/$2.00 at gate. Write Des Moines Radio Amateur Association, Box 88, Des Moines IA 50301.

EGYPTIAN BASH

The Egyptian Radio Club Inc., will hold its annual HAMFEST on Sunday, June 9, 1974 at the picnic grounds, 700 Chouteau Slough Road, Granite City IL. Something for everyone – prizes – games for the children – food at the club house – parking for swaps, etc.

ROCKY ARRL FEST

The 1974 ARRL Rocky Mountain Regional Convention will be held June 7, 8, and and 9, at the Ramada Inn in Pueblo CO. Pre-registration fee is $6, at the door $7. Meals, accomodations and camper/trailer hook-ups will be available for the three days of the convention at special reduced rates. Sunday afternoon banquet with speakers from Industry and the Amateur Radio Field. For additional information write: Convention Committee, P. O. Box 92, Pueblo CO 81002.

SSB IN MISSOURI

The Missouri Single Side Band Net will have their annual picnic at Memorial Park in Jefferson City MO, Sunday June 9, 1974. A covered dish dinner will be served at 12:30. Coffee, ice tea and soft drinks will be provided by the net. Door prizes given. All amateurs, their families and friends are invited.

6M – WOW!

The 6m club of Chicago, Inc., will hold its 17th Annual Hamfest Sunday, June 9, 1974, Southwest of Chicago at Santa Fe Park, 91st and Wolf Road, Willow Springs IL, swap row – picnic grounds – plenty of parking space – refreshments. Advance registration $1.50 – at the gate $2.00. For more information or advance tickets contact: Val Hellwig K9ZWU, 3420 South 60th Court, Cicero IL 60650.

FLUSHING FESTIVITIES

The Hall of Science Radio Club will hold its annual Fleamarket/Auction/Picnic at the Hall of Science, 111th St. and 48th Ave., Flushing Meadow Park, Queenes, on Saturday, June 8, from 10:00AM to 4:00PM. Fleamarket setup 9:00-10:00AM. Admission $1. Sellers $2. No commission. Free parking. An auction service available with 10% fee. Rain date is Saturday, June 15. Zoo, Childrens' Farm, Golf, Boating, Art Museum, Science Museum, etc., adjacent. For more information call/write: 212-699-9400 or Box 1032, Flushing NY 11352.

MONTREAL '74

The 1974 Montreal Hamfest will be held August 4, at the MacDonald College Farm, Ste Anne de Bellevue. Prizes, giant fleamarket, technical sessions, family fun – $2.50/Adult. For more information contact: VE2RM, Box 201, Pointe Claire-Dorval, Quebec H9R 4N9.

FUN IN KANSAS

The Central Kansas ARC sponsored Hamfest will be held June 2. For more information contact: Charles R. Svoboda WØLQK, 225 West 9th, Chapman KS 67431.

MILWAUKEE FEST
(Bastille Day Celebration)

South Milwaukee Amateur Radio Club 4th annual Southeastern Wisconsin Swapfest will be held Saturday, July 13, 1974 at Shepard Park (American Legion Post 434), 9327 South Shepard Avenue, Oak Creek WI. Activities begin at 7:00AM and will run to 5:00PM or later. Parking, picnic area, hot and cold sandwiches and liquid refreshments will be available on the grounds. Admission is $1.00 and includes a "Happy Hour" with free beverages. Prizes will be awarded. Talk-in on 146.94MHz. More details available from: So. Wilwaukee Amateur Radio Club, S.F. Schreiter W9AKF, Secretary, 104 Brookdale Drive, South Milwaukee WI 53172.

INTERNATIONAL HAMFEST

The 11th Annual International Hamfest will be held July 13 and 14, at the Canadian Pavilion in the International Peace Garden between Dunseith ND, and Boissevain, Manitoba. Camping excellent. Party – Contest – Prizes – Meetings. For information contact: Ken Larson

"INDY" 14
(Another Bastille Day Bash)

The Greater Indianapolis Hamfest will be held on Sunday July 14, 1974 at the Marion County Fair grounds on the South East side of Indianapolis at the junction of Interstates 465 and 74. All events including the giant flea market will be under roof. Thirteen area amateur radio clubs combine to bring central Indiana an outstanding convention of technical forums, commercial displays and fellowship. Complete food facilities. Free coffee and donuts in the morning. Gates open at 6:00AM. $2.00 at the gate entitles the bearer to hourly and main prize drawings. There will be a presale ticket drawing for a Genave transceiver. The main prizes consist of an impressive array of low band and 2m Drake gear. There is a good restaurant on the grounds. Free prizes for the kiddies and a full schedule of women's activities.

GRAND EVENT

The Grand Rapids Swap and Shop will be held Saturday, September 21, 1974 at the Hudsonville Fairgrounds, M-21 at 40th Street, three blocks west of the Hudsonville traffic light. Admission is $1.75 at the gate, no charge for tables or trunk sales. Talk-in on .16/.76 and 146.94. For more information contact: Grand Rapids Amateur Radio Association, Inc., P.O. Box 1333, Grand Rapids MI 49501.

TURKEY RUN

The 27th Annual Turkey Run Hamfest and VHF Picnic, sponsored by the Wabash Valley ARA, Inc., will be held Sunday, July 28, at Turkey Run State Park near Rockville, Indiana. Don't miss the Midwest's finest fleamarket. Fun for the whole family: XYL Bingo and fleamarket; food and refreshments, camping facilities, and park recreation for the kids. First Prize: Genave GTX-10, Second Prize: Regency HRT-2, Third Prize: Drake WV-4 VHF Wattmeter; plus many more. Activities begin at 9:00 AM with free coffee and doughnuts. Talk-in 146.94 by W9UUU/9. For details, send SASE to WVARA Hamfest, Box 81, Terre Haute IN 47808.

GLACIER FEST

On the weekend of July 20 and 21, 1974 the WATERTON GLACIER INTERNATIONAL HAMFEST will be held in the beautiful Waterton Lakes National Park. For more information contact: John A. Fyke VE6AIV.

IRVINGTON HAMFEST

The Irvington Radio Amateur Club will hold its annual hamfest on Sunday June 2, 1974, 1-6 PM, at the Irvington PAL Building, 285 Union Ave., Irvington NJ. Admission – 50¢ in advance, $1 at the door. Table rental – $2.50. Refreshments will be available. Door prize!! For more information and advance tickets contact WA2PWZ, 9 Barbara St., Newark NJ 07105.

SRRC HMFST

The SRRC Hamfest will take place June 2, at a new sight – the Bureau County Fairgrounds, Princeton IL (It has formerly been held in Ottawa IL). Easy access Rtes. 80 – 6 – 29 – 34. Advance registration $1.50 before May 20, $2 at the gate. For more information write: G. E. Keith W9QLZ/W9MKS, RFD #1, Box 171, Oglesby IL 61348.

MELBOURNE
HERE I COME

The 9th annual Melbourne Hamfest is September 7-8. All air conditioned, $1.50 at door. Tables $2/day. PCARS, P.O. Box 1004, Melbourne FL 32901.

NINTH SWAPFEST

The ninth annual Northwest Texas Emergency Net Picnic & Swapfest will be held at the City Park in Levelland, Texas on Sunday, August 11, 1974. Bring your own picnic basket. Free registration begins at 0900. Lunch at 1300. Swapping all day. This event is for the entire family. Mobile talk in frequency is the net frequency 3950kHz and 28/88, 34/94 on 2m.

MOBILEERS BASH

The Maryland Mobileers ARC Hamfest is June 16, Father's Day, at Anne Arundel Community College, Arnold MD, at 10:00AM – rain or shine. Talk-in on 10/70 and 146.94. Games, refreshments, contests and an auction are planned. Top awards: 2m transceiver and an electronic calculator. Registration $2, tailgating $2. Free parking, but plan car pools to save precious petrol. For futher information contact: Ted Redick K3UPU, 2 Acton Place, Annapolis MD 21401. Telephone: 301-269-5577.

ZERO-BEATERS A.R.C.
HAMFEST

August 4, 1974, Washington MO City Park. It starts at 10AM CDST, Auction at 11AM. Attendance prizes and other goodies. Auction, free bingo for XYL, cake walk, candy scramble – gigantic traders row. For Hamfest information and tickets write or contact Zero-Beaters ARC, Box 24, Dutzow MO 63342.

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

From Maine WA1EXN reports a March 21st Aurora during which 2s and 4s were worked. Art comments that not many stations were active. April 4th brought a repeat with better signals and 2-3-4-8 and 9 land represented. The high point of the month was working WA2OAF and giving ham state number 50. Ed had been looking for Maine for 14 years from his New Jersey QTH. Art says he spent the winter building test equipment, reworking the rig and "slumming" on 40m.

From the far Northeast to the far Northwest and WA7ECY, Oregon, who reports a dead February except for a short opening to Phoenix on the 28th during which K7PXI, K7VYL and WA7VIS were worked with Q5 signals peaking S7 to 8. March was a similar situation with an opening the 29th to WA7FPO Phoenix and WB6RAM, Barstow. Scott says he and K7ZCB are tentatively planning a DXpedition to Idaho over a weekend sometime this summer to operate 6 and 2m SSB. More details are promised as they develop.

From Texas, Ray K5ZMS/5, says, "16 March. . .Today it gets interesting. At 2055CUT I started hearing strong FM signals and carriers at a number of frequencies below 50.1 from the Southeast – Spanish speaking types. Evidently the MUF shot up this high very quickly from the high 40s for a short period of time. This lasted about a half hour. After a number of calls I heard nothing and it subsided. March 17th worked W4LZW, SC, for QSO #5000 on 6m then worked Alabama, Mississippi and several in Tennessee. March 22nd weak opening to Georgia, Kentucky and North Carolina, conditions unstable, few on. March 27th open to Florida." Ray also says SMIRK now has 89 members in 16 states and 5 countries and is still growing daily.

The New Jersey chapter of the National Awards Hunters Club is sponsoring a "1st Annual 6m QSO Party" from 0000CUT June 1st to 2359CUT June 8th. The exchange is to be RST, ARRL Section and if you are a NAHC member. Scoring is one point for stations in your section, two for stations outside your section and three points for stations outside the continental 48. Multiply your total score by the number of sections plus add one point for each NAHC member worked. Any mode is acceptable with the exception of repeater contacts. Certificates will be awarded to the top scorer in each section. Mail logs to NAHC Contest, c/o Vince Del Giudice, P.O. Box 91, Franklin Lakes NJ 07417 by July 31st.

JM Communications, 101½ Washington St., Venice CA 90291, has announced a linear version of their Model 6100 6m amplifier. The 6100 previously advertised is intended for FM use and is capable of 100 to 145 Watts output with inputs of 15 to 25 Watts. The Model 6100L produces 120 Watts PEP output when used in conjunction in an exciter delivering 10 or so Watts. AM operation is also possible with 40 Watts of carrier being developed when driven by a typical (Communicator III) AM rig. Both amplifiers operate from a 12V supply, feature Silicon balanced emitter transistors, solid state automatic antenna switching, reverse polarity protection, broadband (no tuning) circuitry, plus provision for remote ON-OFF and relative output metering. Both are 10.48cm x 22.86cm x 8.89cm (4 1/8" x 9" x 3 1/2"), come complete with cables, manual, final test sheet and a one year warrantee. The 6100L is switchable from class C to linear operation. The 6100 is $199.95, the 6100L is $219.25 postpaid. A modification kit, the LAK-6100 at $19.95, is available for 6100 owners who would like to convert to linear operation. Solid state has finally fully arrived for the 6m operator. Owners of SBE SB-50s, Gonset Sidewinders or the new Regency and Genave FM rigs will have a ball running this kind of power.

WAØABI

73 REPEATER ATLAS REGISTRATION

REPEATER CALL (WR only)	FORMER CALL	LOCATION (City)	STATE

INPUTS	OUTPUTS	TT Wh TB PL	FM AM RTTY	AUTO PATCH	ERP
		Hz			
		Hz			
		Hz			
		Hz			
		Hz			

USEFUL RANGE (RADIUS)

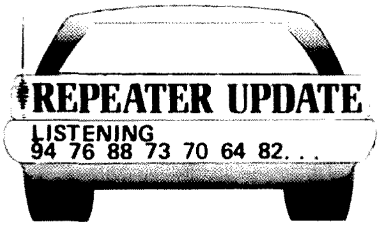
EQUIPMENT

ANTENNAS & HEIGHT ☐ SPLIT SITE ☐ DIPLEXER

REPEATER GROUP/SPONSOR	TRUSTEE	ID—TYPE OR MFR.

☐ I certify that I have received no outside assistance while completing this form.

DATE	SOURCE (NAME/CALL)	SPECIAL OR EMERGENCY FUNCTIONS



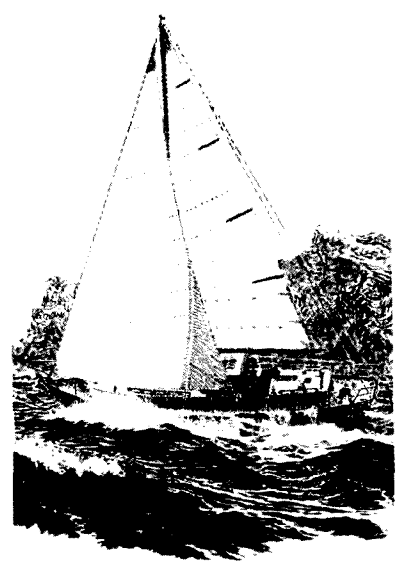
CA	WR6ADZ	Pacifica	T1.8	6.25-6.85
CA	WR6ADY	Pise Look		
CA	WR8AOY	Pisa Lookout	T1.95	6.25-6.85
CA	WR8AEA	Woodside	TZ1	6.25-6.85
CA	WR8AOZ	Pacifica	T1.8	6.25-6.85
CO	WRØADD	Castle Rock		6.07-6.67
FL	WB4QER	Panama City		6.16-6.70
GA	WR4AGD	Augusta		6.34-6.94
				7.90-7.30
GA	WR4AEW	Valdosta		6.16-6.76
IN	WR9ADA	La Porta		6.01-6.61
MO	WR3ACR	Baltimore		7.63-7.03
MI	WR8ADA	Flint		6.31-6.91
MS	WR5ADC	Gautier		6.28-6.88
NC	WR4AGC	Durham		6.22-6.82
NJ	WB2AHF	Vineland		6.055-6.655
NM	WR5ABV	Capitan Mountain		6.34-6.94
NM	WA5YTK	DELETE		
OH	WR8ABS	Middletown		6.01-6.61
OK	WR5ACB	Oklahoma City		6.22-6.82
				52.680-52.525
WA	WR7ACB	Chehalis	T1.95	7.68-7.06
WA	WR7ADB	Marysville		CLOSED
CANADA				
Manitoba				
	VE4BDN	Brandon		6.34-6.94

UPDATES NEEDED

QSL CONTEST

Sailing, sailing, over the... Your editor spent many wakeful nights this month trying to pick a QSL Contest Winner. There were so many excellent entries that reaching a decision was extremely difficult. However, this card sent in by Russell Butterworth WA6TJS/mm, had that special something that set it apart from all the others. Perhaps it's the lure of the sea that tugs in all of us. Nevertheless, congratulations Mr. Butterworth and your boat, the Spucomba.

Is your card something special. Does it arouse oohs and ahs from visiting hams. If so, you have a chance to win a one-year subscription to 73. Send your winning entry to 73 Magazine, Peterborough NH 03458.



WA6TJS

MM

Caveat Emptor?

Price — $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

THE 27th ANNUAL Turkey Run Hamfest and VHF Picnic, sponsored by the Wabash Valley ARA, Inc., will be held Sunday, July 28, at Turkey Run State Park near Rockville, Indiana. Don't miss the Midwest's finest fleamarket. Fun for the whole family: XYL Bingo and fleamarket; food and refreshments, camping facilities, and park recreation for the kids. First Prize: Genave GTX-10, Second Prize: Regency HRT-2, Third Prize: Drake WV-4 VHF Wattmeter; plus many more. Activities begin at 9:00 AM with free coffee and doughnuts. Talk-in 146.94 by W9UUU/9. For details, send SASE to WVARA Hamfest, Box 81, Terre Haute IN 47808.

AUTOMATIC TELEPHONE Answering Computer. The best available. List $239.95. I have two new and still in boxes for $150.00 each. Warranty is still good. First check takes one or both. WB8CTA, 1000 Moore Road, Conway MI 49722.

U.S. GOVERNMENT Topography Maps in six colors are available for most areas in U.S. Send $2.00 and latitude & longitude for each map. Write: Maps, 274 Mainzer, W. St. Paul MN 55118.

TELETYPE EQUIPMENT For Sale: Models 14, 15, 19, 28, 32, 33. TD's, Reperfs, KSR's, ASR's. Parts or complete machines. Write needs and send SASE for complete listing and prices. Larry Pfleger, 10615 W. Ridge Rd., Apt. 54, Hales Corners WI 53130.

SALE-TEST EQUIPMENT: Heath TV Alignment Sweep Generator IG-52 $35.00; Pyramid Capacitor/Resistance Meter, 10 pf-2000mf-25megohm $30.00; Dumont Electronic Switch/Square Wave Generator $15.00; Heath Color Bar/Dot Generator CD-1 $20.00; Heath VTVM V-7A $19.00. All good working condition. Add approx. postage. Michael Windolph, 3140 Meramec, St. Louis MO 63118.

EQUIPMENT FROM 73

The following list of gear, unless otherwise noted, consists of brand new equipment purchased for testing purposes only. Some have been tested, some remain unopened in original cartons. We are offering this gear at a considerable discount on a first-come-first-served basis. Please send Money Orders or Certified Checks only to 73 Magazine, Peterborough NH 03458.

MITS 908M Calculator w/p.s./case ($143) new	$ 100
Logiclocks ($120 new) 3/4" numbers - 6 figs	$ 75
Heath IB-101 counter ($170) - 5 figs	$ 140
Vanguard Scaler - by 10 - to 200 MHz ($120)	$ 75
Clegg 21 220 MHz xcvr - new ($300)	$ 235
Regency 16ch scanner TME-H-LMU ($300) - new -	$ 245
SBE Scanvision, complete, like new ($900)	$ 500
Robot Monitor - new - ($295)	$ 240
Pickering CW keyboard KB-1 ($265) - tested	$ 175
Heath HW-202 - brand new - ($180)	$ 165
Heath HA-2022 amplifier - new ($70) - built	$ 65
Gladding 8ch scanner - Cheyenne - brand new - ($150)	$ 99
Gladding Hi-Scan - 8ch scanner - tested ($180)	$ 99
Genave GTX-2 - used - ($250)	$ 180
Motorola KW 2m amplifier - used	$ 350
Heath IC-2009 calculator - brand new ($92)	$ 88
SBE-450 xcvr - new - ($450)	$ 299
Standard 1400 2m 22ch xcvr 10w ($550) - used	$ 250
Heath HWA-202-1 power supply - new - built ($30)	$ 25
Signal One CX7-A - tested - perfect - like new - fantastic	$1990
Kenwood Twins - Tested - like new ($900)	$ 750
Standard 146 2m HT - used ($289)	$ 190
Fannon intercom - exec - 6 ch master - ($60) tested	$ 35
Icom IC-60 450 MHz xcvr - brand new ($375)	$ 275
Concord TV camera MTC-15 ch5-6 output - tested ($500)	$ 250
Concord video monitor VM-12 - tested ($400)	$ 250
Concord all channel TV tuner Dem-011 ($600)	$ 250
Concord VTR - like new - fantastic ($400)	$ 300
Bell & Howell 2966 VTR - like new - excellent ($995)	$ 350
Bell & Howell 2965 portable VTR - new ($1595)	$ 475
Batteries for B&H 2965 - like new ($36)	$ 25
Vanguard 2m preamplifier - used - ($25)	$ 15
Regency 450 MHz scanner - ($200) - like new	$ 140
Varitronics PA-50 2m amp ($110) - brand new - 10w in 50 vout	$ 75
RP tone burst gen - 5 freq - TB-5 - exc ($37.50)	$ 25
Electro-Voice 717 noise cancelling ceramic mike - new ($13)	$ 10
Hitachi stereo cassette recorder - exc - ($120)	$ 75
Hitachi AM-FM cassette recorder - exc - ($90)	$ 50
Turner mike - noise can NC350DM - brand new	$ 30
Vanguard conv 144-146/14-15 MHz -407 - new - ($50)	$ 40
Antenna Spec rubber ducky antennas HM-4 2m	$ 4
SWR meter - exc ($25) KW	$ 12
Test Labs - 10 in 1 - SE-400 ($25) as is	$ 10
Concord stereo recorder-changer - 12 cassettes ($240) brand new	$ 135
VTR Monitor - exc - Hitachi ($225)	$ 125
Radio Shack Code cassette - new ($6)	$ 4
Regency HR-6 ($240) six meter 10w xcvr 12ch	$ 199
Standard SR-C826M ($360) 2m 10w xcvr 12 ch	$ 299
Regency HR-220 ($239) 220 MHz 10w 12 ch	$ 199
Regency ACT-R8H/L Scr ($160) VHF/UHF 8ch scr receiver	$ 136
Standard SR-C826MA ($398) Latest model 10w 12ch 2m xcvr	$ 339
Regency HR-2MS ($319) 2m 15w xcvr with 8ch scanner	$ 269
Icom IC-22 ($289) 10w 22ch 2m xcvr	$ 245
SBE SB-450TRC ($180) 450 MHz transverter	$ 149
SBE SB-1PA ($190) 10w in 40w out power amplifier 2m	$ 159
Pace 104H ($90) Scanner VHF 4 channel	$ 69
Regency Pocket scanner 4 channel ACT-P4H ($120)	$ 99
Cohia 220 MHz Transceiver 10w 12ch ($300)	$ 255
Amphenol RG-8/U Polyfoam 100' with PL-259 connectors ($24)	$ 19
Icom IC-21 ($359) demo unit - perfect shape 10w 22ch ac/dc	$ 299
Standard 14U 2m 22ch superfantastic rig. VOX ($510) demo	$ 499

All Prices fob: UPS collect.
73 Magazine — Peterborough NH 03456

THE ORIGINAL FM Hamfest Sunday August 4, 1974, near Angola IN. Free flea market, entertainment for ladies and kids. Picnic grounds, campsites, boating, food, soft drinks, available rain or shine. For information contact: Fort Wayne Repeater Assoc. Box 6022, Fort Wayne IN 46806.

TECH MANUALS for govt. surplus gear — $6.50 each: R-390/URR, R-220/URR, URM-25D, CV-591A/URR, CV-278/GR, TRM-1, TS-382D/U, TS-497B/URR, TT-63A/FGC, URM-32. W3IHD, 7218 Roanne Drive WA DC 20021.

COLLECTORS ITEM, Nazi Kwea German Wehrmacht WW-II Receiver, magnesium alloy chassis, working condition, spare tubes. Freq range LW-BC-SW with crystal calibrator. Requires 2 volt filament, 90V plate. WT, 100 pounds FOB Dartmouth, N.S. Best offer over $400.00. Contact Jim Murphy VE1PV, 100 Joffre Street, Dartmouth, Nova Scotia.

FREE CRYSTALS with the purchase of any 2m FM radio. Write for our deal on the rig of your choice. Factory-authorized dealers for Regency, Drake, Icom, Kenwood, Tempo, Alpha, Genave, Swan, Clegg, Ten-Tec, Standard, Midland, Telex, Hallicrafters, Galaxy, Sony, Hy-Gain, CushCraft, Mosley and Hustler. For the best deal around on HF or VHF gear, see us first or see us last, but see us before you buy. Write or call us today for our low quote and become one of the many happy and satisfied customers of Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. 812-894-2397.

FLEA MARKET/AUCTION/PICNIC! Hall of Science Radio Club annual event Saturday June 8 10am-4pm Flushing Meadow Park Queens, 111th St. 48th Ave. Rain date June 15. Admission $1.00 - sellers $2.00 no commissions. Auction service at 10% fee. Free parking. Zoo, Children's Farm, golf, boating museums adjacent. Info 212-699-9400 or write Box 1032, Flushing NY 11352.

DANVILLE HAMFEST at Douglas Park in Danville IL on September 1, 1974. Take Bowman Avenue Exit off I-74 and follow the signs. Prizes will include a low-band rig and VHF gear, antennas, electronic keyer, wattmeters, SWR bridges, and many others. Camping and motel accomodations nearby. Food and plenty of parking available. Huge flea market and commercial displays. Tickets are $2 or three for $5. Advance tickets available from Dave WA9PDS, Dolan Rd., Catlin IL 61817. Send check or M.O. and SASE. Talk-in on 22/82 and 94 simplex.

NE555V: $1.10, 8038 Waveform Generator: $6.95, 1103 (1024 Bit Ram): $4.50, DG200BA Analog Switch: $3.25, 2N6084 RF PWR: $10.50, 74181 Alu: $3.75, Catalog: 10¢. ELECTRONIC DISCOUNT SALES, 138 N. 81st St., Mesa AZ 85207.

G.E. MASTR 100W highband RPT or base station, RPT panel, perfect cond $400.00. G.E. Mastr 60W mobil high band U.H.S. RX 8 freq, 6 inc. $375.00. G.E. Port-a-mobil high band 10W 94 16-76 with charger $250.00. Jim Maloney, 2670 Tierra Cir., Winter Park FL 32789, Ph. 305-678-0244 after 8PM.

KLM AND MADISON ELECTRONICS present the finest in VHF antennas. 144-148MHz, 7-element to 16-element; 9-element $31.95; 14-element $45.95; 16-element $49.95; 220MHz; 420-450MHz, 14-element $19.95; 27-element $41.95; write literature. All prices FOB Houston. Free flyer. Madison Electronics, 1508 McKinney, Houston TX 77002. 713-224-2668; Nite 713-497-5683.

MIX PLEASURE with pleasure at the Hamburg International Hamfest on September 21. For information contact Lin Brownell WB2HCL, 210 Buffalo, Hamburg NY 14075.

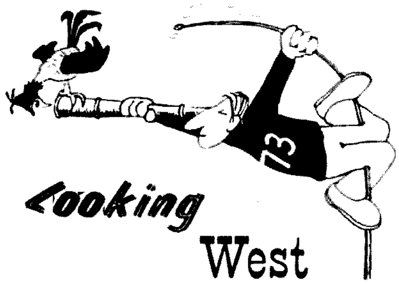
WANTED: HT200 2 meters, any condition. State price and condition. Ron Dierkens WA6QVE, 3367 Ellington Dr., Altadena CA 91001.

SB-102 FOR SALE. Excellent condition. Prefer Dallas-Fort Worth area buyer. Must deliver in person. Call or write 817-293-2128, 6920 Stonewall, Fort Worth TX 76119.

DRAKE 2B, all crystals, manual, calibrator, excellent $160 plus shipping. John Skubick, 1040 Meadowbrook, Warren OH 44484.

FOR SALE: NCX-5 MK11 Digital, 200W, 10-80 SSB, CW, AM transceiver with matching NCXA power supply-speaker and manual. $350.00 Jim W1VYB 617-922-3850.

GIVE your voltmeter a memory. Don't look the other way with meter probe in the works. Details free. Dan WN8RJZ Box 423A, Owosso MI 48867.



Looking West

Bill Pasternak WA2HVK/6
14725 Titus St. #4
Panorama City CA 91402

Guess by now you may have gotten the idea that Sharon and I are very happy and proud to be a part of the "Southland." I am also quite proud of an amateur organization out here that some two and a half years ago begot itself into existance and in short order straightened out the mess that was the Southern California FM scene. True, like any other part of the nation we too have our problems from time to time, but the Southern California Repeater Association has never run away from any of them. Quite the contrary, they have faced any and all situations with a willingness and objectivity that is unsurpassed. While not everyone is always happy with their decisions, the record is proof positive that the majority of the FM populous has benefitted from what they have done and will continue to do. On March 24, SCRA held a meeting and this time I was able to attend and see the SCRA in operation for myself.

Aside from the election of Dick Flanagan W6OLD, as their 1974 chairperson, the most important announcement made was that of the FCC granting the WR6ABB repeater "Special Temporary Authority" referred to as STA for development and implementation of a fully automatic remote control system for the machine. Thanks to the hard work of Dick McKay K6VGP, outgoing SCRA chairperson and Fred Deeg K6AEH, the trustee of WR6ABB, permission has been granted for the *Pallisades Amateur Radio Club* to utilize the repeater input channel as a secondary control frequency and designate certain individuals that the club selects to control WR6ABB via this system. The STA stipulated that the existing wireline control system was to remain as primary control system and that the secondary, on-channel system was only to be used when a designated control operator was within reach. Moreover, it was stipulated that all regular users of the machine would be considered to be "Official Repeater Observers" and put upon them the responsibility of immediately notifying either a primary or secondary control operator in the event of malfunction or misuse of the repeater. According to Fred, the system will be in operation in the near future. If this experiment runs well, and there is little reason to doubt it will, a petition for rule-making will be presented to the FCC by the SCRA when the STA expires in mid-September. However, both P.A.R.C. and SCRA are determined to go by the book in this matter, and knowing both groups as well as I do, I can assure the FCC that they will get an accurate report on the outcome of this authorized experiment, as they have requested in the STA. It is my sincere hope that we here in the Southland can lead the way in easing the control restrictions that all repeaters now must operate under.

One of the major problems that we face here is the overcrowded conditions that exist on 2m within the 146-148MHz spectrum. Even with all standard repeater allocations filled and one machine sharing a 1MHz plus special split with simplex there are not enough channel pairs to go around. Yet, the SCRA continually receives requests for channel allocations from new groups that want their own 2m machine. To that end, a resolution was adopted to study the feasibility of issuing split-split or tertiary channel allocations in this area. For those of you unfamiliar with the term split-split it means putting new repeaters halfway between already existing machines. As you may know from past writings, I was personally involved in such a project back in NY about three years ago and from personal experience I can attest to the fact that it can be done. In fact, the job should be much easier today owing to the many improvements in the receiver selectivity of today's newer transceivers. Add to this the type of terrain we have, i.e., mountain vs valley, and I can see successful doubling of the available number of available allocations. The SCRA Tech Committee was delegated to study the matter and make recommendations on the matter at the next meeting and LW will keep you informed of the outcome.

Finally, a new concept in amateur repeaters is being born in Phoenix AZ. The sponsors of WR7ABT call it a "Full Service" amateur repeater and the first of its kind anywhere in the U.S. By using a number of tape recorders and touchtone control, and being very careful in providing program material that will not violate the Commission rule prohibiting broadcasting, WR7ABT will soon provide its users with such diverse material as multi-speed code practice, assistance in correcting FM problems, location and time of radio club meetings and other information that will be of benefit to their amateur community. One innovation that they are incorporating I think is of top benefit. How many times have you been in QSO only to have another ham break for a signal or deviation report. One of WR7ABT's new services should eliminate this. An operator will be able to access a tape recorder via the repeater, make a 10 second test transmission and then play him or herself back for a first-hand look (or hear) of the way they sound. Now that one I really like and if I ever put up a machine again that's one idea I will be sure to incorporate. LW wishes Phoenix good luck with their "second generation" machine.

I usually close with a little aside or comment, but this time I will answer a question; an important one to me. Many times I have been asked why I write a monthly column. It's not for money or glory, but rather it's because I sincerely believe in the following, "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; *or abridging the freedom of speech or of the press;* or the right of the people to peaceably assemble, and to petition the government for a redress of grievances." If perchance you didn't recognize it, you have just read the First Amendment to the Constitution of the United States of America. To that ideal and to the betterment of amateur radio I devote this column.

WA2HVK/6

NEW PRODUCTS

73 TESTS THE IC-230

ICOM has come up with a two meter transceiver which has set many manufacturers to burning the midnight oil in their labs. It has 66 channels of synthesized operation, and that covers all of the standardized FM channels from 146.0 to 148.0 – the dial readout is for the receiver and the transmitter can be switched to send 600 kHz higher or lower, as well as on the same channel for direct (simplex) communications. It is exceptionally versatile.

The receiver, which is the most important aspect of any transceiver, is a beaut. Mr. Inoue and his engineers went for every dB they could with this one, always being careful not to forget the probales of intermod, overload, and other discouraging miseries we've had with more than one of the other rigs on the market.

The receiver is dual conversion. Single conversion is on the horizon, but we haven't tried a receiver using it that was quite as good as a well designed double conversion job. They'll be along, you may be sure, as the scientists cram more and more transistors into those IC chips. The 230 has an FET front end and high-Q helicalized cavity resonators to keep out the garbage. By keeping the gain in the i-f the Icom gang got rid of a lot of the overload problems. They made up for it with a six stage i-f amplifier. The two local oscillators are zener regulated for stability.

The transmitter puts out at least ten watts and is also zener regulated in the oscillator. It is load protected in case your antenna falls off or gets shorted, and the low pass filter in the output will be appreciated by television viewers you drive past.

Now, outside of all the technical data on the unit, how does it work? Is it easy to change channels while driving?

The rig, being very small, mounts just about anywhere in a car. We put it on the side of the transmission hump next to my knee, facing up. It didn't take a half hour to get into place, even for a mechanical klutz. This puts the controls in easy reach of the hand, including the upper-lower offset switch for the transmitter which is on the top of the unit instead of the front panel. You have to get at this one when you move to the 147 MHz channels unless you make a small modification to put that function on the 146-147 MHz segment switch – and this is a very simple mod.

There are two knobs for switching channels, one for the hundreds of kHz, and one for the 30-kHz jumps. With this simple system you can switch from one repeater to another without even looking at the rig – which is excellent for driving. You just count the switch positions as you turn the knob. This is particularly handy for someone like Wayne who has to put on his glasses for the simplest of reading. It's a bore having to put your glasses on in the car just to change a repeater channel.

The 66 channels makes it so you can use most of the repeaters on the air today. If you do much traveling you'll appreciate having every standard channel in the rig. How many crystals would that take? If you wanted them all it would take 132 crystals, and at $4 each that would come to $528. You could get by for half that because most of us don't need the reverse pair crystals, but that is still a bundle.

The ICOM will put you on the reverse pair, if you want. This is almost imperative these days when you are flying so you won't lift every repeater for three hundred miles around every time you talk. It's also useful when you are close by the other op and can get him better on the repeater input frequency than the output. It happens.

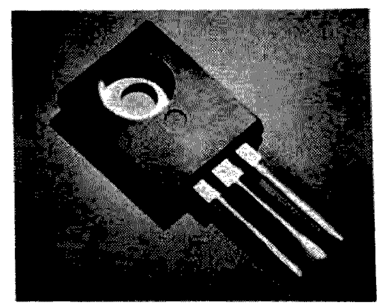
If you hook another 230 owner you can use any of the simplex channels for fairly private contacts. Or even a locally unused repeater input or output channel.

The ICOM 230 has worked without a flaw all through the New Hampshire winter, from about 20 below zero on up. It has always been right on channel on both transmit and receive, and it has always sounded superb. It is one of the few ham rigs that works well on top of the local mountain. Most of them have trouble with the several commercial repeaters up there, or even miseries from ham repeaters on adjacent channels. One well known rig loses sensitivity and cross modulates when the next channel lower is coming through strongly. Another very well known rig is totally useless on the mountain – everything comes through.

About the only drawback of the IC-230 is that it doesn't get the splinter repeaters, but even that can be corrected by changing a crystal, if you've got splinters in your area.

Bravo ICOM 230.

PUSH-PULL AMPLIFIER APPLICATION NOTE



The advantages and design of broadband push-pull amplifiers are described in an application note available from TRW Semiconductors. The 8-page application note discusses, in particular, 60 and 120W 225-400MHz push-pull amplifiers using TRW JØ2000, JØ2005 transistors.

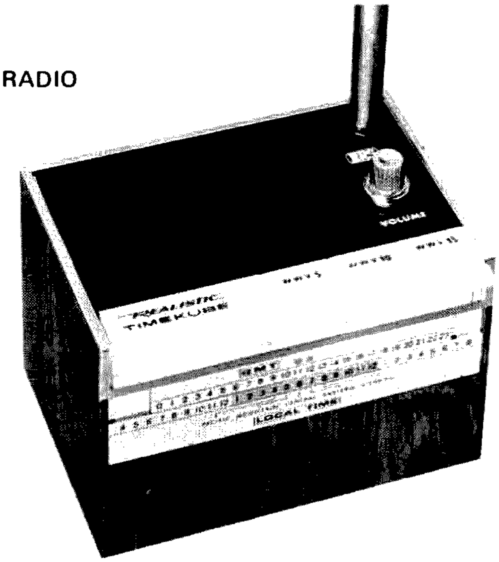
The application note describes the basic concept of the push-pull approach and compares it with conventional designs.

Schematic drawings present the complete electrical circuit for 60 or 120W push-pull amplifiers, and layouts for components, heat sinks and circuit board. The electrical circuit for a push-pull driver amplifier providing up to 30 watts output is also presented.

The application note includes specification ratings, electrical characteristics and package dimensions for TRW JØ2000 and JØ2005 rf Power Transistors. The units incorporate internal integrated circuits to reduce the effects of the reactive part of the input impedance to nearly zero. JØ2000/JØ2005 units are rated for 30/20 watts and 200-400 MHz.

Further information and a copy of the application note are available from *Sales Manager, TRW Semiconductors, 14520 Aviation Blvd., Lawndale, CA 90260; phone (213) 679-4561.*

REALISTIC TIMEKUBE RADIO



Even if you don't have time on your hands, now you can have it at your fingertips with the new Realistic Timekube (TM) radio from Radio Shack.

A sliding scale on the front of the Timekube allows instant conversion of UTC to local time. Pushbutton selection of three different WWV frequencies (5, 10 and 15 MHz) is said to assure optimum reception in all parts of the country at any time of the day or night. National Bureau of Standards time signals are controlled by an atomic clock which is accurate to within 20 billionths of a second per day, or within one second in 31,709 years!

Some of the additional data broadcast by WWV includes: geophysical alerts and summaries of geophysical events during the previous 24-hour period. "At sea" weather information is broadcast in three 45-minute segments four times in each 24-hour period.

The Realistic Timekube desk radio, in simulated rosewood case, 8.26cm x 11.75cm x 8.89cm (3¼ x 4-5/8 x 3½"), is priced at $49.95. Operates on one 9V battery.

Realistic products are available from more than 2,500 Radio Shack stores.

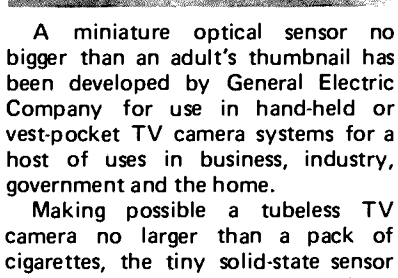
McMOS DATA BOOK

Over 300 pages of product data, basic technology information, applications information, and product selector guides are included in the new "McMOS Integrated Circuits Data Book," from Motorola. Just off the presses, it is probably the most comprehensive product directory of complementary MOS circuits ever produced.

The McMOS product line cataloged in this new book includes complete data on 68 separate functions. These devices plus 12 new devices introduced in late 1973, (not included in the book) offer the system designer a choice of 80 logic functions. It is now possible to implement any type of digital system using McMOS circuits; therefore, presenting the design engineer with the same type of design flexibility in CMOS that before was possible only with bipolar logics such as MECL 10,000 and DTL/TTL from a logic design point of view.

Order your copy of the, "McMOS Integrated Circuits Data Book," by sending $2.50 to: Technical Information Center, Motorola Semiconductor Products, Inc., P.O. Box 20924, Phoenix AZ 85036.

SUB-MINIATURE SENSOR



A miniature optical sensor no bigger than an adult's thumbnail has been developed by General Electric Company for use in hand-held or vest-pocket TV camera systems for a host of uses in business, industry, government and the home.

Making possible a tubeless TV camera no larger than a pack of cigarettes, the tiny solid-state sensor and essential circuitry is called a "CID Module" (Charge Injection Device) and converts optical images to electrical video signals.

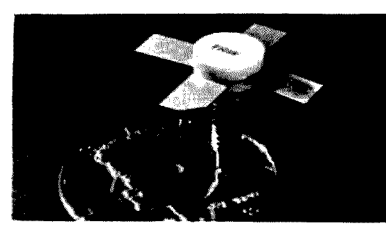
With decided advantages over tube and other solid-state imagers, GE's CID Module brings into sharp focus the possibility of completely new imaging and sensing systems in the foreseeable future. Such systems include home video, industrial control, TV cameras, security systems, auto safety, supermarket checkout and numerous other applications for systems' manufacturers and users.

The dynamic range of the CID module – approximately 500:1 – provides broad gray shade or tonal rendition exceeding the performance of conventional image tube cameras.

Matrix readout of the CID sensor provides several inherent advantages over existing solid-state technologies. Total area of the CID device is used for sensing, thereby providing higher sensitivity than devices requiring transfer and storage in their readout technique. "Rand m access capability," also provides a valuable characteristic for applications such as low bandwidth communications and guidance systems.

The tiny 100 x 100 image sensor by GE's Optoelectronic Systems Operation, here, is only 1/4-inches long X 3/8-inches wide and consists of a two-dimensional array of 10,000 charged storage image sites. For more information write: *General Electric, 2100 Gardiner Lane, Louisville KY 440205.*

HIGH POWER PLASTIC TRANSISTOR SERIES



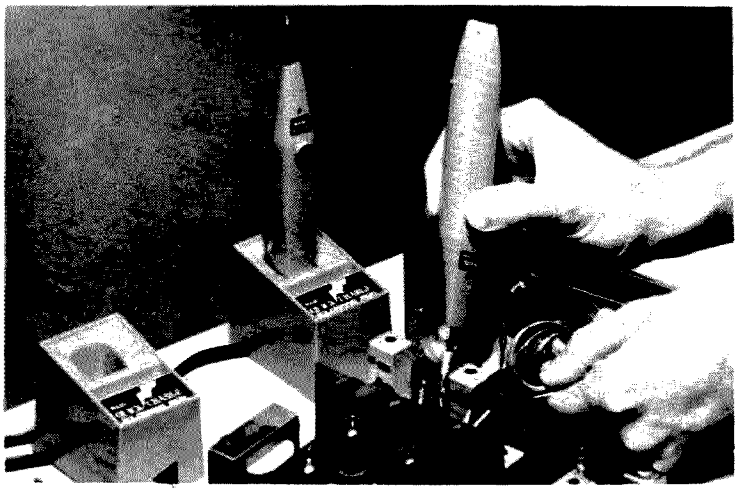
Motorola's new 2N6497, 2N6498 and 2N6499 silicon NPN power transistors have dissipation ratings of 80W P_D, made possible by a significantly better plastic package. Motorola's type 199 plastic package design eliminates mechanical mounting stress while providing improved heat transfer characteristics, and convenience and cost savings in mounting.

These devices are rated at 5Adc continuous collector current 10 Amperes peak, and have a Gain-Bandwidth product of 5 MHz. Well suited for inverter and ignition system applications as well as general purpose use, this series is priced 15 to 25% below comparable metal parts.

The 2N6497, 2N6498, 2N6499 are rated at 250, 300 and 350 Vdc V_{CEO} respectively, and priced at $1.55, $1.85 and $2.75 in 100-999 lots. Convenient mounting hardware for this series is also available from Motorola.

For further information please contact the *Technical Information Center, Motorola Semiconductor Products, Inc., Box 20924, Phoenix AZ 85036.*

QUICK CHARGE CORDLESS ISO-TIP SOLDERING IRON



Wahl eliminated the cord from the soldering iron quite some time ago with its 'Iso-Tip' Cordless Soldering Iron. But now it's cordless for even a greater percentage of the time with the new, orange, "Quick Charge" Iso-Tip.

This decrease in recharging time is due to the "Quick Charge" iron's special premium quality long-life nickel cadmium batteries. These batteries are designed for charging at high rates for longer periods of time without deterioration and will outlast standard batteries.

The new lower base stand (with slot for spare tip) will return a partially discharged battery to full capacity in an hour or two. And a completely discharged battery can be fully recharged and used again in about 4 hours, giving tip performance equivalent to up to 50W and over 700° temperature.

The "Quick Charge" has the same low voltage and special isolated-tip construction as the original 'Iso-Tip' which eliminates electrical leakage and the need for grounding, reducing and the risk of heat damage to sensitive components. The tip is easily replaceable with any of the 4 completely different tip sizes from heavy duty to fine. The manufacturer *does* caution against interchanging a 'standard' Iso-Tip and a "Quick Charge" stand, however, as the units are not interchangeable.

Pressing the button gives you soldering heat in 5 seconds plus a built-in work light on the working area. Pilot light, too. And an exclusive "lock off" switch to prevent accidental heating of the tip.

The unit is designed for good "feel" and balance – only 8 inches long with tip and weighs just 6 ounces. The "Quick Charge" carries enough power to make up to 125 electronic joints (or more) per charge. And it automatically begins recharging when replaced in its stand. No wires to connect; no "positioning" of the iron in its stand. And it can't overcharge itself.

Model 7700 "Quick Charge" kit consists of Cordless "Quick Charge" Soldering Iron; Separate Recharging Stand; One #7545 Fine Tip; One #7546 Heavy Duty Tip; and an instruction booklet.

For further information contact your local electronic dealer or *Noel Wallen at the Wahl Clipper Corporation, 2902 Locust Street, Sterling, Illinois 61081. Phone: 815-625-6525.*

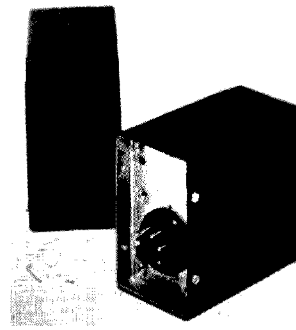
SIMULTANEOUS READ/WRITE MEMORY

A high performance 16-bit Multiport Register File capable of reading 4-bits and/or writing 2-bits at the same time has been introduced by Motorola. Designated the MC10143L, this MECL random access memory is an excellent example of a large scale integrated (LSI) device produced in the very fast MECL 10,000 series logic family. This versatile memory unit has a complexity equivalent to 110 gates. Access time to any four bits is 10 nanoseconds while simultaneously writing in new data.

The ECL outputs of the MC10143 are capable of driving transmission lines directly eliminating translator delay times. Outputs of the MC10143 can be wire ORed together or several registor files can be combined on a bus line. On chip decoders and write amplifiers reduced the number of external components required to use the MC10143.

For further information contact: *Technical Information Center, Motorola Inc., Semiconductor Products Division, P.O. Box 20924, Phoenix AZ 85036.*

HV POWER SUPPLY



The James Millen Manufacturing Co., Inc. is pleased to announce the addition of the new #90202-D Plug-in Module High Voltage Power Supply for use with small Cathode Ray Display Systems. The #90202-D supplements the other Millen plug-in modules.

The Millen #90202-D High Voltage Power Supply is designed to provide up to 1400V high-voltage dc accelerating potential and filament-heating power for small and medium size cathode ray tube indicators. The high voltage is rectified by a semiconductor bridge, producing a 120Hz ripple frequency which is filtered by a 2-stage RC filter. With a 1.1mA external dc load, the ripple voltage is less than 1.5V rms and increasing the dc output current to 3.0mA increases the ripple-voltage to less than 3V rms. With the 1.1mA dc output current, the voltage provided is 1350V ac input. Since this power supply unit is not regulated or stabilized, the output voltage is proportional to the input voltage. It is possible to adjust the output voltage within reasonable limits, by varying the load current, such as by choosing high, or low, values of voltage divider resistors for the focusing and brightness control network.

The #90202-D High-Voltage Power Supply is designed for continuous service under suitable conditions where adequate ventilation is provided. Momentary short-circuits will not destroy the circuit elements internally mounted, but continued short circuits may burn out some of the over-loaded components. Hence, it is desirable to use a fuse which will prevent burn-out conditions from becoming established.

A feature of the circuit allows grounding of either the (+) or (-) terminal of the dc high voltage. The 6.3V, 0.6A filament winding is insulated to stand the full dc output voltage, with the filament connected to either the positive or negative high voltage terminal. For more information contact *James Millen Manufacturing Company, Inc., 150 Exchange Street, Malden MA 02148.*

George McCarthy W6SUN
1191 Calle Arroyo
Thousand Oaks CA 91360

POOR MAN'S QUAD

(If you aren't poor when you start, you will be.)

Thanks very much for the QSO, Fred. I'd like to talk with you more, but I must QRT now. I've been on for over an hour and I do have some things to do, so 73's and hope to meet you again. This is FG7XL signing off and clear and leaving the air."

The soft French accent of Monique's voice slipped permanently away, leaving only background static, punctuated by a few calls from the diehards who never can bring themselves to believe that anyone could have the temerity to turn a receiver off, just because they had politely and firmly announced that this was their intention.

Soon only the static filled the speaker of my Drake 2-B. I sat slumped in the chair, conjugating obscenities in every tense I could think of. Oh, how I wanted that first contact with Guadalupe Island! Monique had been on ten meters for over an hour. Her signal had gradually slipped as band conditions changed. As the signal faded, I had grown more and more desperate, employing every technique my slim resources could muster. My left hand vibrated with anticipation as I waited for the crucial sign-overs. Only nanoseconds could have elapsed before I had turned the transmit switch on the HT-37 and blurted out my call sign. Somehow there was always some jerk in the middle of *his* call letters when I started mine. I tried tail-ending. The cacaphony of calls stopped momentarily and I jumped in like sly old Rennie the Fox. Back on receive. Another station is calling her with a 20 over 9 signal and capping it off by having the gall (or is it de Gaulle) to call in *French*. Naturally, she was delighted to talk to *him*.

I sat there for fifteen minutes, gradually slipping into a state of torpor, which is my equivalent for deep thought. It had been less than three months since I had been back on the air after an absence of fifteen years. I had been a ham for over twenty-five years, and there were Novices who had logged more operating time than I.

My return had been a joy after all the years of intending to get back on the air and not quite making it. I operated 75 phone to start. Having three quarters of an acre of land eliminated any antenna space problems. The 75 meter dipole was up fifty feet and gave good east-west transmission. A friend had given me a Mosley trap vertical for the other bands. He was the comptroller where I had worked and he had temporarily become interested in becoming a ham. He had purchased a brand new Drake 2-B and the Mosley vertical. He installed the vertical on his roof without any radials, and then compounded that oversight by shorting out the RG-58U at the base of the vertical. He

SCANVISION

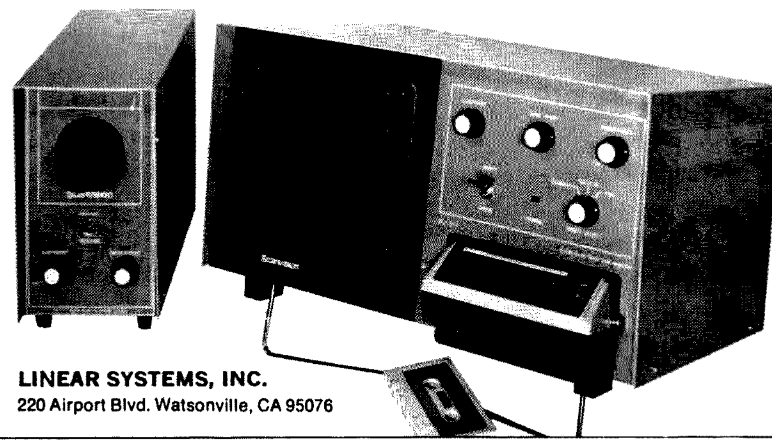
ready to operate SSTV monitor with built-in cassette tape recorder

Now—a high quality slow-scan monitor so complete that the non-engineer radio amateur can connect it to his receiver and start enjoying SSTV in minutes! The pleasure and excitement potential of SSTV can best be realized when a tape recorder is part of the system. So—**exclusive**—a cassette tape recorder is built-in—wired—matched for correct levels and impedances—ready to go. Now, tape incoming pics for future viewing. Or pre-tape self and family, station scenes, call letters for later transmission (of course, "live" pics from the camera can be transmitted directly).

SBE SCANVISION is conservative—reliable—has picture-proved circuitry—is all solid state except for scope tube in monitor and the videocon camera pickup tube. Equipment fully meets all accepted SSTV standards.

SB-1MTV, monitor.
SB-1CTV, camera complete w/f1.9, 35 mm lens.

WRITE FOR BROCHURE



SBE

LINEAR SYSTEMS, INC.
220 Airport Blvd. Watsonville, CA 95076

was disappointed with the performance of his receiver for some reason and quickly lost interest. Subsequently I bought the Drake for two shares of stock in a glamorous defense conglomerate and $25 cash. Some time later I accepted employment with said conglomerate and their stock promptly dropped to one-third of its former price. I maintained this was the sheerest coincidence, but my friend never lets our occasional lunch pass without a hurt reference to the stock deal. My rejoinder is that I sold him the stock, I didn't tell him to *keep* it.

Shortly after I had returned to the air I worked XE1CCW in Mexico City. Gus was putting in a tremendous signal. He said he was using a vertical on top of a flat-roofed home. The vertical was mounted on a 4 ft cement pillar and had 64 radials! He had put 16 radials for each of the four bands and they sloped down to the roof, making about a 110 degree angle to the mast. Gus reported very low SWR and high signal-to-noise ratio on all bands.

My home is one of those long, low, California ranch types with a cedar shake roof of moderate pitch. It was totally unsuited for a duplication of XE1CWW's installation. Naturally, I attempted to duplicate his antenna.

Unfortunately I didn't have the right kind of wire. A quick calculation of the length required indicated that I would need to refinance the home to pay for No. 12 copper. Refusing to give up on that basis I found a large roll of No. 32 PE wire I had surplus from some warehouse.

Gus had said the more radials the better, so I cut twenty for each of the four bands. I made an eight inch circle of No. 12 copper and began to solder one end of the eighty wires to the circle. It takes a while to solder eighty wires. I had conceived the result to look like the spokes of a wheel. I dragged the entire mess up to the roof where I was confronted with a simple problem. The house is 107 ft long, but only 30 ft wide. The ten and fifteen meter radials wouldn't have posed any problem, *if* I could have unsnarled them from what had somehow become an extended Gordian knot. I stood on the roof grasping one end of this unplanned cable, looking as though I were

TRANSISTORS

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MJE 1093 PNP DARLINGTON, 70W, 80V $2.25
JAN2222A high speed NPN switch .... $.39
MPF 120 dual gate MOS FET .... $.75
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MFE 20001 VHF/UHF N channel JFET .... $.80

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Solid State, new, with hook-up diagrams $5.25

MC 1455(555) TIMER
New $1.65

DTL SALES
930 Dual 4-input NAND GATE
946 Quad 2-input NAND GATE
962 Triple 3-input NAND GATE
$.25 each, 10/$1.75, 100/$15.00 ANY MIX

TTL SALE
New – House numbered SN7400, SN7402, SN7410, SN7430
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ANY MIX

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posing for the cover of one of the old Bell Telephone books.

Several hours later and only minutes away from a total nervous collapse, I gave up trying to sort out the radials and just laid them on the roof and tried to spread them around in some semblance of a circular pattern. The forty meter radials dangled over the front and rear of the house. I climbed down and went inside for a drink or two.

When I emerged an hour later the sun was just dipping into the west. We were having one of those gorgeous California sunsets. The sky glowed red. It was beautiful. I turned and looked at my house. Every little curled and twisted piece of No. 32 wire had captured a glint of sunset. It looked as though a giant spider had squatted over the place and disgorged a year's supply of metallic spider web.

"Oh, what the hell," I thought, "it didn't cost anything, and I only blew one weekend." Eventually most of the forty meter radials got pruned off with hedge shears. It was this peerless contribution to the art of communications that had unsuccessfully transmitted my pleas for recognition to Monique.

I got up from the chair and walked outside. I glared at the Mosley. There must be a better way. I quickly brushed aside the obvious, a cram course at the Berlitz School of Languages so I could call anyone in *their* native tongue.

How about those guys who always seemed to get through in spite of the pileup? They said they were using QUAD antennas. That's it. I will build a QUAD antenna and then I also will get through any pileup with my barefoot HT-37.

I got Bill Orr's book, *All About Quads*, and poured over it until the pages were dog-eared. It was the only definitive information available. I began to dream of the DX I would work with my quad. At that time I was working for a major space firm fifty miles from the QTH, so I had at least two and a half hours of driving time each day to devote to thinking about quads. I spent ten hours a day thinking about quads.

After stopping at several rug emporiums I found that rugs no longer came rolled on bamboo poles but on cardboard tubes. I called an outfit that made rattan furniture. I got a quick answer. "We don't have no bamboo for no goddammed antennas!" I surmised I had just joined a large group of Los Angeles hams looking for bamboo.

Thwarted? Not on your life! Why not just buy a ready-made quad kit from one of the several outfits on the market? *Buy?* I shrank back from that notion like Dracula from a crucifix. There must be a way.

One day at work, while I was supposed to be concerned with some business proposal, it came to me. A sudden inspiration. All great ideas are inspirations, born of that magic amalgam of insight and sheer genius. I could hardly wait for the coming weekend. My idea? Simplicity itself! Just make the spreaders out of plastic pipe easily and cheaply obtainable at the local building supply house.

I began to expand on the concept during the next two days and nights. (When I'm in a creative mood time becomes meaningless.) I would use 3/4 in. pipe for the first ten feet and a reducing coupler down to 1/2 in. pipe for the remaining three feet. I had laid a lot

of plastic pipe in the lawns and had no trouble gluing it together with solvent. I plunged on. Cross couplers would be used to insure a perfect X. For a simple two element quad I would only need 80 ft of 3/4 in. pipe and 24 ft of 1/2 in. pipe, 8 couplers, 2 cross couplers and a can of solvent.

You must realize that with us creative types the thought is father to the deed, and I was waiting outside Builders' Emporium for opening hour Saturday morning. Naturally the clod who runs the hardware section leaped to the conclusion that I was embarked on a sprinkler job and offered to show me the new pop-up heads. I favored him with a patronizing smile and allowed as how my purchases were destined for a use far above such mundane matters as lawn watering.

I struggled through the cash register line clutching my lengths of plastic pipe with all of the protective zeal of a missionary carrying the native Chief's first born son toward the baptismal waters. The bill was just under $15. What a wonderful thing the human brain is! To think I had conceived this idea and was about to witness its birth. I rushed home and laid the pipe out in the back yard. With glue can and hacksaw I quickly assembled the eight spreaders. The next step was childishly simple. I inserted the ends of the 3/4 in. pipe into the cross fittings and cemented them in place. My two quad sections were finished! Less than an hour had elapsed!

I decided to transport the sections over to the driveway where I would attach them to the 30 in. squares of plywood with C clamps. I stooped down and raised the center section waist high. The four ends remained imperturbably on the ground. A hint of disaster began to penetrate. I raised the center to the top of my head. Oh, no! I raised it as high as I could reach. The ends just cleared the ground. I stood there looking like I was holding the framework of a giant parasol. As soon as I began to walk my creation began an undulating motion. I tried to damp its oscillation by changing the cadence of my step. This required a rapid change of rhythm since the damn thing was really responsive. I was in the midst of this inadvertent boo-ga-loo when I noticed my neighbors staring thoughtfully in my direc-

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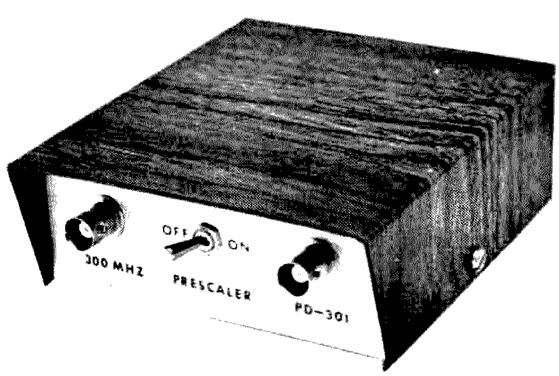

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tion. They have tended to view my behavior as a little strange for some time, and this latest exhibition did nothing to shake their confidence in the opinion that I was a prime candidate for the local laughing academy just north of here.

I'll admit it. I was undone. I laid the whole thing down on the driveway and sat in the sun, gently flexing my fingers along the back of my neck. Sometimes I get these damn headaches . . .

At times like these, ham radio can be such a help. I went inside and fired up the rig on fifteen. A WØ in Milwaukee came back to my CQ. After the amenities, I described my plight in lucid terms. He immediately had the perfect solution! "Yes, sir," he said, "just cap the ends, fill it up with water and freeze the whole thing. It'll be just as rigid as you want. Ha, ha, ha," he cackled insanely, vastly amused at his cleverness. I complained of sudden QSB and signed off.

After a few days I went out and disassembled the whole thing. The plastic pipe is lying on the ground in the far end of the back yard. It can be had for a very reasonable price. It has been there for three years.

Subscribing to some idiotic ethic that postulates that adversity is meant to strengthen character, I resumed brooding about how to put up an inexpensive quad.

In no time at all it became evident to me that I should have chosen material with more strength, say like one-inch wooden doweling. In order to insure success I decided to fiberglass the doweling. Better to spend a little extra and be sure. I asked some of the boating types at work about fiberglassing and was assured it was a relatively simple operation.

Naturally, I was crouched by the door of Builders' Emporium on Saturday morning, money in hand, awaiting opening hour.

The only problem with the doweling was length. The longest pieces they had were eleven feet, two feet too short. This was only a temporary setback. My fevered brain devised an on-the-spot fix. I picked out eight pieces of 3/4 in. doweling. I would simply drill out the ends of the 1 in. doweling about eight inches and insert the 3/4 in. dowel and glue them together.

Congratulating myself on my obvious problem-solving ability, I proceeded to the section containing materials for fiberglassing. Horror! The prices! The boating types had forgotten to tell me I could have gold plated the poles for less money. A further complication – Builders' didn't have the glass cloth in rolls. I wanted the materials right then, not later. I bought two large squares of glass cloth and the cans of resin and setting agent. I forgot to buy solvent for cleaning up the resin. This time the bill was more imposing – $15.40 for the lumber and $18.85 for the fiberglass junk. Heck, with tax, it was only a little over $35, and that's still a long way from the $59.95 most quad kits are advertised for.

I rushed home with my newest purchases, imbued with new enthusiasm, a blend of overconfidence and plain ignorance.

I glanced at the directions for fiberglassing. Admittedly, it was raining out and the temperature was in the low 60's, but who wants to split hairs over little things like that?

I laid out the big squares of glass cloth and began cutting strips for rolling onto the doweling. No one had told me that glass cloth has such a tendency to unravel. In short order the family room looked as if Florence Nightingale had held a bandage-wrapping rally for the Crimean War. I decided it would be better if I conducted the actual wrapping operation out on the porch even though the weather was miserable.

I had less trouble drilling the ends of the 1 in. doweling to accept the 3/4 in. doweling than I had expected. (I was beginning to develop a paranoidal expectation of trouble at every step.) Realizing that I had weakened the walls of the doweling with the drilling, I wrapped the outside with copper wire (No. 32 PE of course) and wrapped electrical tape over the wire. The result would have pleased a Watusi tribesman. It looked like a thirteen and a half foot spear.

I laid one of the spears between two chairs and began the fiberglassing operation. The trouble was that the three foot strips of glass cloth tended to come loose before I could overlay the next strip and get it started. I had liberally doused the spear with

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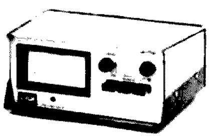

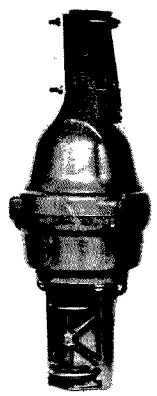

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resin before starting. The whole operation wasn't going well. The resin got all over my hands and arms. Bits of the glass cloth started to adhere to the resin. I began to panic. More cloth. More resin. The spear was beginning to look lumpy in places. I abandoned all pretence at competence. Resin was puddling on the concrete floor beneath the spear. The resin on my hands, arms and clothing was beginning to congeal. More cloth came off on me. I felt like an old W. C. Fields movie, trying to peel cloth off of one hand only to have it stick on the other hand. I also felt like an ass.

My teenagers chose this moment to arrive home with some friends. "Hey you guys, look, it's the MUMMY." They all peered at me. "I think it's FRANKENSTEIN," said the youngest. "You're both wrong," the eldest said flatly, "can't you see the neighbors have tarred and feathered the Old Man while we were gone? I told you they would get him sooner or later." They beat a hasty retreat. There's a certain look I get at these times.

I made one right decision. The other seven poles would remain unfiberglassed. It was raining anyway, so I couldn't go much further. Back down to Builders' Emporium and the purchase of some epoxy paint. Expensive as hell, but the paint man said it would withstand anything. Only another $5.15 which beats trying to fiberglass the poles anyway.

While the epoxy paint was drying, I zipped back down to Builders' Emporium (I'm well known there) and picked up two three inch end bells, a three inch threaded T, and a twelve inch threaded pipe. Then over to the lumber section where I got more doweling to fit into the pipe sections. I forced a five foot section of doweling through the T joint and jammed an end bell on either end. Another section of doweling was stuck into the bottom of the T joint to make a mast. The end bells would be bolted to some aluminum plates and the spreaders attached to the plates with C clamps.

The pipe fittings were expensive and the doweling wasn't cheap either. The bill came to $13.71, but the end was in sight.

I was forced to wait for the next weekend to assemble my masterpiece, since it was January and too dark to work by the time I got home.

Saturday I strung the wires for the three bands on each of the sections. I had been advised by competent engineering talent at the space factory where I labored that some of the hams had successfully fed all three elements with a single 52Ω coax by bringing the three driven elements together at a single feedpoint. This seemed so simple I wondered how it could work. It was simple. It didn't work. I tried resonating with my grid dipper, but I kept getting sharp dips all over the place and finally abandoned this brief attempt at the scientific approach. I copped out and used three different coax cables, one for each band.

I had started another project, an "inexpensive" home-built tower (more about *that* some other time) and decided I would use the first twenty foot section to test my quad.

I rounded up my teenagers, all four, and we hoisted the assembled quad up on the tower. I stood back to admire my handi-

work. Alas! The weight of the No. 12 wire was too much for the 3/4 in. doweling. The whole quad appeared to suffer from advanced arthritis. Although the ten and fifteen meter sections attached to the 1 in. doweling were reasonably taut, the twenty meter section caused the 3/4 in. doweling to bend over at an awkward angle. The twenty meter section just wasn't going to hack it. I got up on a ladder with a saw and methodically cut the spreaders just above the fifteen meter attachment. The boom wasn't too tight in the end bells and so I was able to spin the spreaders around until all eight were cut down.

Standing amid the wreckage of tangled wire and stumps of wood, I could feel that funny headache in the back of my neck coming on. There was nothing more I could do that evening. I went inside and fixed some drinks. I drank all of the drinks.

The next morning I decided I might as well try out the remaining two bands. I hooked them up and turned on the rig. I could hardly believe my ears. I switched over to the Mosley vertical. The signal was S-5. I switched back to the quad. The meter read S-9 plus 10 dB. Fantastic! I swung the quad around. The signal started dropping. It was down to 40 dB off the side. Out of sight! I was so excited I forgot about breakfast and lunch. I was working one station after another, first on ten and then on fifteen. By early evening I was gracefully acknowledging S-9 reports from Japan. One JA gave me an S-8, and I immediately decided he must have inferior receiving equipment.

This was only the beginning of a long line of quad antennas in the three years that have passed since that lovely Sunday morning in January.

I found that the big end plates had a windmill effect, and I had steel straps welded to the end bells, which proved strong enough to support the spreaders with much less wind resistance. Also I found that I really needed some matching device between the coax and the driven element. A gamma match worked out quite well.

I began a long series of experiments with element spacing for the individual bands. My peerless engineering had limited me to ten and fifteen, but I was able to satisfy myself that the quad is one hell of an antenna when it is tuned up properly. Generally speaking, if you have a low SWR and are getting at least 20 dB front-to-back, you are in good shape. It is possible to get a higher front-to-back at some sacrifice in bandwidth. My present quad is a three-element job with no tuning stubs. I cut the reflector 5% longer and the director 5% shorter than the driven element and strung them up as closed loops without any tuning stubs. So far, after a week's testing, it seems to be working out pretty well, 25 dB over S-9 in Tokyo and 40 over in Guayaquil, Ecuador.

I suffered through a few further reverses. The wind blew the tower town and broke one spreader, which I quickly replaced. One day at work I got a phone call from the youngest harmonic who plaintively relayed the information that my daughter's horse had got loose, tripped over the guy wires and the tower was down again, this time with two broken spreaders. Small matter! Now I knew I had a working antenna, and I accepted these trivial happenings with equanimity, not even the hint of those headaches.

Honesty requires me to admit that by the end of the year I purchsed the $59.95 kit from Polyquad. This finally got me on twenty. Incidentally, I ran a series of tests while the quad was mounted on a twelve foot four-by-four. The twenty meter section barely cleared the ground. In both Europe and Africa I was only 5 dB under K6SHA who is about two miles away. Since Casey was running 2 KW PEP to a four-element Yagi 60 feet up and I was barefoot with the HT-37, he should have been at least 10 dB louder on power factor alone. Remember, my quad is barely off the ground.

I gave the original quad antenna to W6UOD and his son, Steve WB6UHE. It was really a minor investment anyway. Only cost me $68 or so, which any way you figure it is only a few dollars more than those store-bought kits. I don't care to discuss those headaches or the liquor bill. As the new generation would say, "It isn't relevant."

That 54 ft all-wood white tower though . . . but, as I said earlier, that's another story.

. . .W6SUN

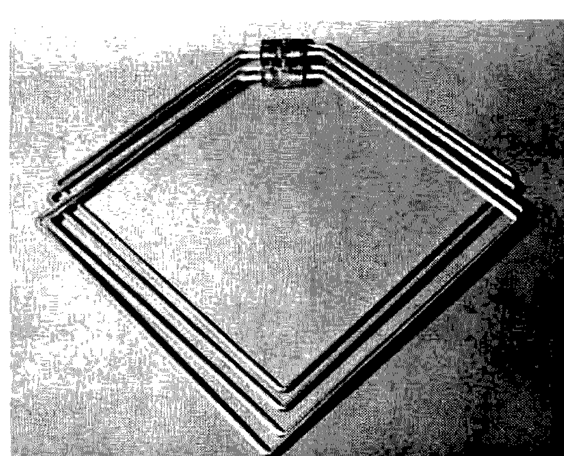
Ralph W. Campbell W4KAE
405 Granite Circle
Lexington KY 40503

RECONCILING THE LONG SQUARED QUAD

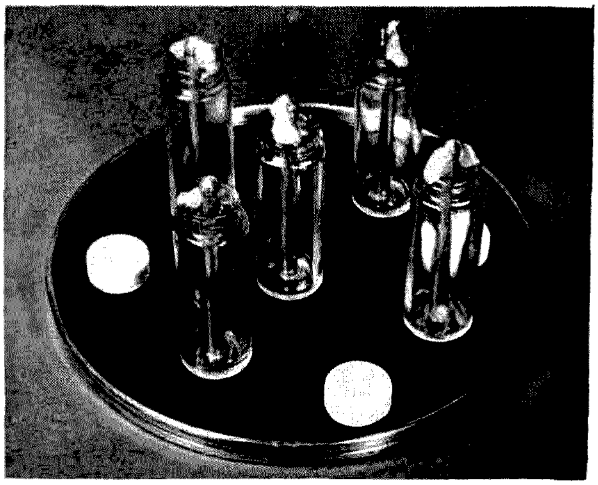
Referring to the August 1969 issue of *73* Magazine: The article beginning on page-101 was the first full length composition I ever had printed. Although another paper was carefully rewritten for a non-paying journal, a nice check from the Editor spurred my research and experimentation which resulted in the final issuance of Patent No. 3,491,361. This was the birth of the Long Circular Quad, as we know it today.

Original work was performed with the diagonal-square or "diamond shape" parasitic-element quad; however, this approach was abandoned for the circular loops. The round model was tested free and the gain and performance properties were just about as expected, except for normalized frequency being somewhat lower than the array was cut for.

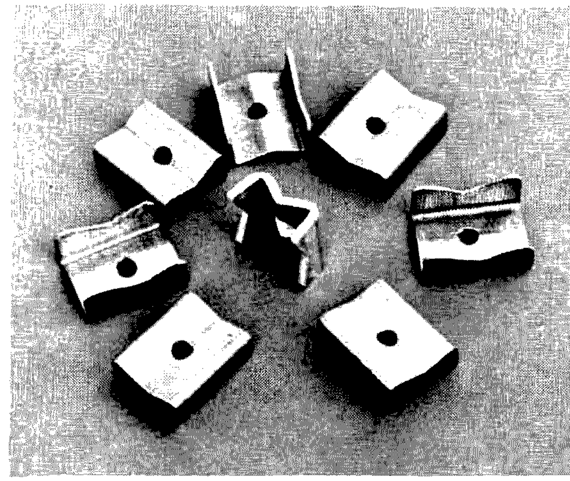
This article tells about *new* research on the older – diamond – model; and if it doesn't herald a new breakthrough in antenna design, at least it spells out the danger zones to be avoided. The L.C.Q. theory has therefore been more firmly established, using *circular* elements. From our experiment comes two new ideas: 1. The function



Hand-made casting-resin plastic insulators installed upon 5/16 in. solid aluminum rod stock. This work, which included aluminum welding at a local sheet metal shop, was performed "free" because shop was supplied with T.V samples!



Nine dram bottles used in preparation of large size insulator molding. Greased rod stock, cut to proper length, is held in bottles with modeling clay and an epoxy blob from the bottom. Valspar Casting Resin No. 8880, was then poured in. When dry, glass was cracked off carefully.



Parent-part of mounting hardware is shown in center of this photo. Note I had the seven additional parts manufactured by a local sheet metal shop; after being flatly refused help from a well-known antenna manufacturer! Parts are plastic insulator-to-boom clamps.

of the parasitic groups is compared to standard waveguide/mode concepts; 2. Constant-phase boom length, with regard to the number of discrete directors in any given group, is explained.

Curiously, the 18 dBi we were claiming for the original array resulted in 13 dBr, for an over-the-dipole comparison, when improvements were made. A separate article on the 11 Element L.C.Q. is in the files of 73 Magazine; and this is the antenna depicted on the August cover. The 11 Element L.C.Q. exceeds performance for a 215B long john (15 element) Yagi by a full 3 dBr. All models of the L.C.Q. in print can be scaled for higher UHF frequencies, but it is of prime importance to maintain proper circumference to wire-diameter ratios. On 432 MHz, my conclusion is that a 4 ft. reflecting screen may be needed to offset increased stray radiation behind the driven reflector, for the same gain figures as on VHF.

Theory

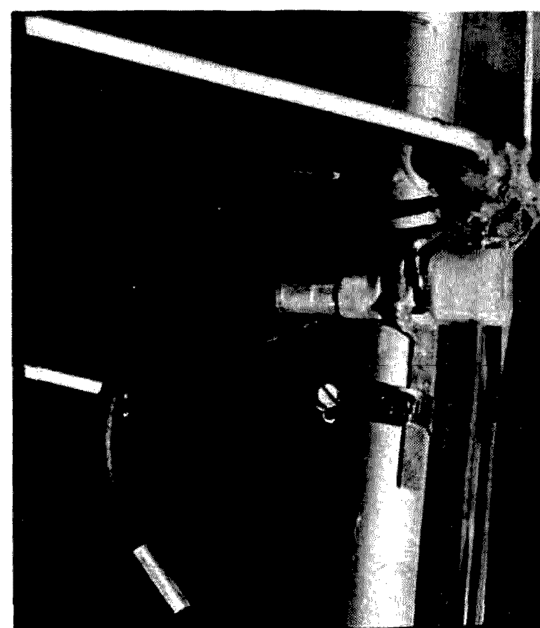
For a long time vertex-fed diamond-shaped elements have been used on the HF bands. There was apparently no difference between this type mount for quads, or for the kind with a square-side parallel to earth. This is for truly parasitic discrete elements, and not for driven parasitic groups. However, from my experiments on VHF, it is clear in my mind that an E-vector to H-vector cancellation can occur as noticed here, which must reconcile, especially in light of the fact that for both parallel and diamond configurations, the feed point is classically correct (i.e., feed connections made to the middle of a lower parallel member, or at the six o'clock vertex of the diamond-shape, for desired E-vector polarization to be horizontal).

For the VHF experiment, it seems that we've got a waveguide-type mode propagation similar to the TM (transverse megnetic) field pattern for Long Squared Quad versus the TE (transverse electric) for the L.C.Q. Subscripts are normally used below the TM or TE letters; however, since I cannot accurately define which mode is which, I am content to mention only that the TE field appears replaced by the TM field. If you consult MIT's Principals of Radar, or NAVSHIPS No.900,018, a simple breakdown is illustrated. With this apparent mode-shift, keeping the feedpoint the same obviously results in cancellation – which was noticed!

Mode considerations for discrete element parasitic quads (not groups) is not treated because there is no common-driven energy to be propagated. For the LCQ it is proper to think of this array as having properties of an irradiated slot-structure, or like several mag-

netic dipoles stacked end-to-end on a single boom. It is worth remembering that a vertical magnetic-slot antenna radiates a horizontally polarized E-vector.

Constant-phase boom theory is another concept derived from our work. Basically, this theory says that an increasing number of parasitic, strapped circular elements may be added (up to about 7 per group) as long as there's the same spacing (boom length) as there are quarter-wavelengths between the discrete elements in the next group ahead. Seven discrete elements have 6 ninety-degree intervals, so the previous group boom spacing must be 540 electrical degrees, etc. To initiate another group on-the-boom requires an increase, on a per-group basis, of 90 electrical degrees so that array will become proportionately longer as more elements are added. Thus, the next group out from the 7 element one will contain 8 elements at 630 electrical degrees from the last element mounted. Since more than 7 elements could theoretically result in unwanted side-lobes, you can content yourself with a total of 24 elements VHF or 25



Close-up view of the rugged ferrite balun, constructed for the square quad. Although complete balance of the driven diamond-shaped squares was obtained, as well as energy propagated along the structure, cancellation or cross polarization occurred.

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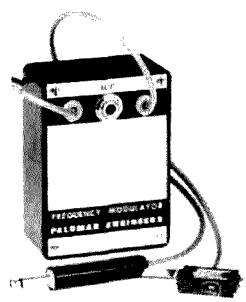

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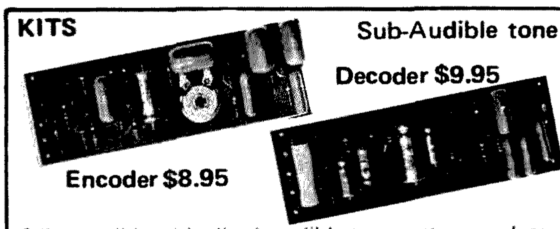

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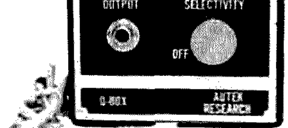

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elements UHF, with use of a passive reflector. This concept is more fully explained in Patent No. 3,491,361. I will make patent copies available for $1.00 each, should anyone desire a copy of this document.

Construction

A great deal of time was spent in constructing the array shown in photograph No. 1. Other photos show how I handmade my own insulators from glass 9 dram pill bottles, with a finished closeup of this work. The 5/16 in. aluminum elements were fluxlessly welded, because of inferior quality of the material supplied.

Conclusion

Sometimes the best results in independent research come from failure. The array under discussion was just that, by amateur standards. Out of two months construction time (to get "weird" parts by mail) plus four months more in evaluation, new theories were developed which are protected in my patent; however, we don't mind if hams use these arrays for non-commercial purposes.

In retrospect it is impossible to get much more gain from the diamond-shaped quad with discrete parasitic elements, for anything you might build with more than 8 elements (see Fig. 1, page 101 of August 1969 *73* Magazine) unless you use circular loops and strapping. Horizontally square, strapped elements will work fair – I think – but the mode may be wrong. Our patent was allowed over the Wells' case, where interference was encountered, so we know our way works best!

Although not mentioned earlier, I recommend HF users of cubical-quad antennas to try the diagonal-square type of array in preference to the horizontally-square. I think Kirk Electronics, and Particularly Hy-Gain's new "Hy-Quad" array are top-of-the-line. Always check the match with the antenna mounted no closer than 1/8 wavelength above ground, on the lowest frequency (usually 20 meters) for unity SWR – AT THE ANTENNA TERMINALS. The advantage of the diamond shape on HF is probably a lowered angle of radiation. Don't strap those elements!

. . .W4KAE

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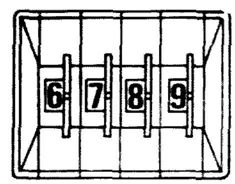

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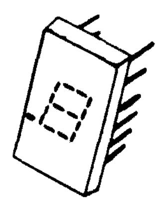

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Carl C. Drumeller W5JJ
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You want your antenna to take a load from your transmitter, but there's only one frequency at which it will accept that load naturally and with no undue urging. What is that frequency?

You can find that frequency with an antenna noise bridge invented by Ted Hart. You'll need an even multiple of half waves in your feedline if the indications are to be meaningful. The same limitation applies to a grid-dip meter coupled to a loop at the transmitter end of the feedline. If you want to do it the hard way, you can plot a curve with an SWR meter . . . and still have the probability that the curve really is distorted by feedline length factors.

If one rocks back on one's haunches and considers the situation, what you're really concerned with is the antenna's ability to accept *power*. Once it accepts that power, it'll radiate it, less that very small portion that'll go out in the form of heat waves because of ohmic losses. Now, it's axiomatic that a reactive termination will not accept a load. So the point at which the antenna accepts maximum power is the point where its resistance (resistance, not impedance, not reactance) most nearly matches the feedline's impedance. you hope that its resistance is almost all radiation resistance, with a very minimum of ohmic resistance, but that's neither here nor there; you built that ratio into your antenna initially, and this is no time to be worrying about it.

Now that you've bought the acceptance-of-power concept, you next consider how you're going to judge it. Here's where you want to keep it simple, keep it basic. What, you ask yourself, is the most simple form of rf power generator for the frequency I want to use? You can't get any more simple than a Hartley! So build one. Use a tube big enough to put out a couple of watts so you'll not have to squint too much to detect that rf power. Of course, if you're dead set on going modern, there's nothing wrong with using a big and husky transistor.

How to detect that rf power? Still keeping it simple, you take a dial light bulb or a flashlight bulb and a single turn of insulated wire. Put them in a series circuit. Loosely couple it to the coil of the Hartley oscillator. Couple it closely enough to get a fair degree of light, keeping in mind that you can determine changes in that amount of light better when it's not at full brilliancy.

Now couple the antenna feedline loosely to the Hartley's coil, using another single turn of insulated wire. Tune the oscillator slowly. When it hits the frequency at which the antenna accepts a load (takes power out of the oscillator), the light will dim. Read the oscillator's frequency with your receiver. That's all. You've finished the job.

. . . W5JJ

J. K. Bach WB2PAP
Ivy Hill Road
Walden NY 12586

MATCHING

Here are several methods for making everything match everything else.

Impedance-Matching" is a phrase that haunts the electronics student. He may ask half a dozen people before he gets any kind of explanation of what it means, let alone what it implies. And the explanation may be simply that "all impedances have to be matched to each other," which is occasionally correct, but more often wrong. He may even be told that it takes higher mathematics to explain, which is completely in error. Lower mathematics will do nicely.

This concept is not taught to beginners at all, though I think it should be, since it is an important part of how things work. I myself taught it to my Novice classes, to the amused surprise of my sponsors.

Let me point out at once that the effects of mismatch in impedances can be seen by man, woman and child in the family television receiver. The antenna has a 300Ω impedance, and it is connected to a flat ribbon line of 300Ω impedance, and the other end of this line is connected to the TV set which also has a 300Ω input impedance. All matched; that is the way it is supposed to be. But let us assume that the TV set input impedance is actually 600Ω instead of 300 for some reason – mistuning, trouble or whatever. Now the signal from the antenna enters the line, goes all the way to the TV set, and *most* of it enters and makes a picture. But the mismatch reflects a small part of the signal back up the line all the way to the antenna. Now the antenna is not a perfect match either; it should be, but in practice it can't be. Most of the reflected signal goes into the antenna and is radiated back to the transmitter and good riddance, I don't know a better place for it. But a small fraction is reflected from the antenna mismatch down the transmission line again to the receiver, where most of it goes in.

But the reflected signal, or echo, is late. Meanwhile, the scan on the face of the tube has moved a little, as it should, to pick up the next part of the picture. And here comes a late reflection of something already printed, which prints on top of the signal that should be received at this time to form a "ghost." This image is faint, but annoying, especially if it happens to be an extra face. Everyone has seen this. You have too – remember?

There is a very simple trick that often – not invariably – remedies this trouble. Take a palm-sized piece of aluminum foil from the kitchen and wrap it around the ribbon lead near the set, like a flat napkin ring. Watch the picture while you slide this gadget slowly

TABLE

Rl	Rt	I	I^2	Pg	Pl	Pt	E	K
10	20	.500	.250	2.50	2.50	5.00	5.00	50%
0	10	1.000	1.000	10.00	0	10.00	0	0
∞	∞	0	0	0	0	0	10.00	0
990	1.000	.01	.0001	.001	.0990	.100	9.900	99%
11	21	.476	.227	2.27	2.497	5.767	5.236	43.28%
9	19	.526	.277	2.77	2.493	5.263	4.734	47.61%

up and down the line, an inch or so at a time, until the "ghost" is exorcised.

A friend of mine who is a pretty good TV repairman, had a very odd case of trouble. He checked the antenna and transmission line, which he followed through the house wall and across a clothes closet and thence downstairs to the TV receiver. He couldn't figure out why the line had been strung across the empty closet, but an even greater mystery was that someone had hung an ordinary wire coat hanger on the ribbon line. He took it off as a matter of course, and went down to the receiver (see Fig. 1).

Here he soon found the trouble, which he fixed. Confidently, he turned the receiver on again, fully expecting it to work perfectly. He got a hazy picture of poor quality. He was trying to clear this up with just about every adjustment the set had, when the lady of the house came in to check on his progress.

She took one look at the picture and exclaimed, "Oh, somebody must've taken the coat hanger off!" and dashed upstairs. This was ridiculous, of course – there wasn't so much as a kink or crease in the line, and the connections were good. The line was all in one piece.

Suddenly the picture cleared up and the woman came back downstairs. He got his money and left. When I heard this story, I asked him: "And was that *all* she did? Put the coat hanger back on?"

"I was afraid to ask her. Who knows about things like that?"

Auto drivers see the effects also, especially in the winter when they start their cars. When they engage the starter switch, the battery is connected straight across the starter-motor. This is wound with copper bars instead of wire, and is as near to being a short circuit in an iron casing as you could ask. It develops over a horsepower to spin a big engine.

In cold weather, it doesn't exactly spin it – it groans and shudders and grinds, but it does turn over, slowly. The ignition doesn't work very well, since the voltage is too low.

And why is it low? Because roughly half the voltage is being dropped in the battery itself. This also means that *half the power* is being lost in the battery! Under these conditions, the transfer efficiency is only 50%. This is why a battery is rated, say, 100 amp-

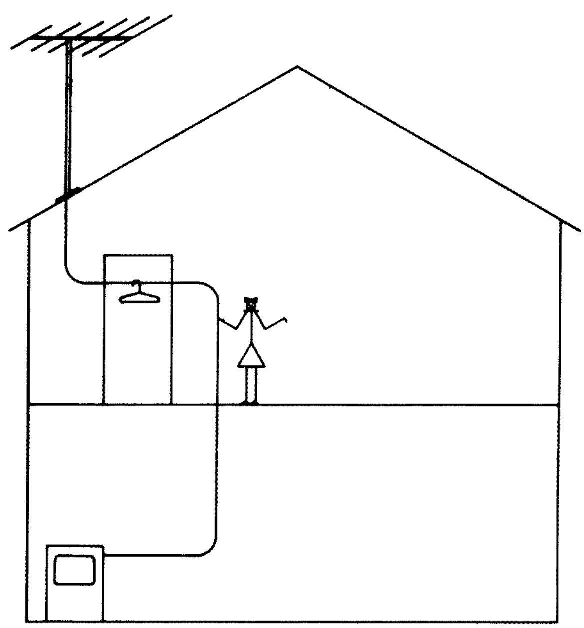

Fig. 1.

ere hours for a one ampere rate, and a great deal less for higher rates. The heat that is lost in the battery does do some good – in warming up the battery it speeds up the chemical reaction that produces the current and so gives a power boost when it is badly needed.

By this time, the heavy oil in the bearings and on cylinder walls has loosened a bit, and the engine turns easier. As the mechanical load lightens, the starter-motor turns faster. It generates more back-voltage to oppose the battery voltage, so that the current from the battery is less. Now the battery voltage goes

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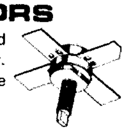

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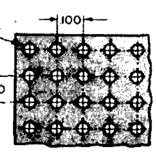

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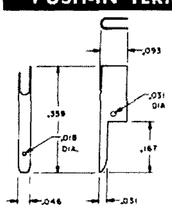
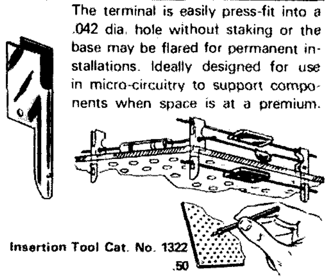


The terminal is easily press-fit into a .042 dia. hole without staking or the base may be flared for permanent installations. Ideally designed for use in micro-circuitry to support components when space is at a premium.



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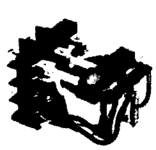

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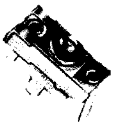
404	.81	424	.80	461	.32	467	1.04
405	1.01	425	.85	462	.52	468	1.20
406	1.04	426	1.01	463	.64	469	1.22
420	.58	427	1.12				



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up in consequence, and the ignition has enough for a nice hot spark and VAROOOM! – the engine starts.

The only thing that could be done about that 50% business would be to increase the size of the battery. If you made it ten times bigger, then the voltage would drop only a little. But think of hauling all that big battery around, and of the room it would take, and what it would cost. Obviously, the solution is too costly.

Some drivers trickle-charge their batteries each winter night. (I do.) This puts a few ampere hours into their batteries, but more important, it warms them a little, making more current available for morning starts.

An example of the opposite case is your local power company. What is the output impedance of those big generators, do you suppose? One thing is sure – the entire load impedance of a big city won't match it, because the impedance of the generator would be much, *much* lower. If the impedances were equal (matched) the big, expensive generating machines would burn up literally in seconds – they run warm as it is, but they don't dissipate more than a couple of percent of the power they produce.

When it comes to impedance matching, the local telephone company is the champion. They match anything and everything to cut reflections to an absolute minimum. This means lines, coils, repeaters, test instruments, subscribers' telephones, the whole works. Even here there are exceptions: the volume indicator meters which are used to check transmission levels in broadcast stations, recording studios and telephone offices. They are deliberately made high impedance so they won't load down the line under test and drain the signal, at the same time giving a false indication. And that is exactly the same reason your VOM is 20,000Ω per volt instead of a much cheaper 1,000Ω per volt resistance – accuracy and minimum drain.

From this point on, generalities won't do; let's try some of the "lower mathematics" I mentioned. Figure 2 shows a simple generator which may be a battery-charging generator, vacuum-tube oscillator, or almost anything that puts out current and has an

internal resistance of 10Ω. You can't get in behind this resistance in any fashion; this is what you get at the generator terminals. The voltage is a constant 10V *inside the generator* but the voltage you get outside depends on the load.

Suppose the load resistance matches the generator resistance (impedances are the same). Refer to the table: the top line shows this condition, and reads as follows:

Rl, the load resistance, is 10Ω. Rt is the total resistance in the circuit, 20Ω. I is the current in the circuit, .500A. I x I is this quantity squared, .250A. Pg is the power lost in the generator as heat, 2.5W. Pl is the useful power, the power in the load, also 2.5W. Pt is the sum of these two, the total power generated. E is the voltage across the line (generator terminals and the load, all the same point). K is the transfer efficiency, which you already know is 50%. This looks very low, and usually we want to do a lot better than this. Sometimes we can't, or other things are much more important, as in signal transmission.

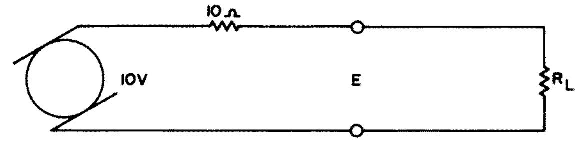


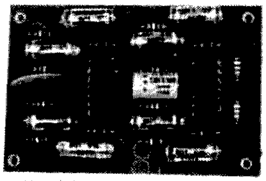
Fig. 2.

Look at line two. Here, the load is zero, a short circuit. The total resistance is only 10Ω the current 1 A, the current-squared 1 A, and all the power is lost as heat in the generator itself, 10W. The power transferred to the short circuit is zero because there is no resistance in it. The total power is, of course, that in the generator, 10W. The voltage across the short circuit is zero, and the transfer efficiency is also zero. Not hard, so far, just simple Ohm's law.

Now in line three we take the opposite extreme, or an open circuit. Load resistance, infinite. Total resistance, infinite. Current zero, current-squared zero, power lost in generator zero, power delivered to the load zero, total generated power zero, voltage equals the full 10V – no I x R drop. Transfer efficiency is zero too.

Here comes the lower mathematics – to make it easier, we'll use a load of 990Ω

CW FILTER



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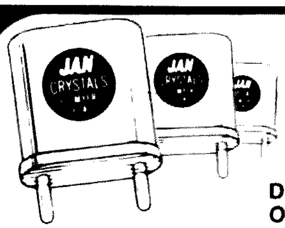

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which will simplify currents and such. Load 990Ω total resistance 1,000Ω, 10 mils (.01A), current squared 100 μA or .0001A, power lost in the generator is only a milliwatt (whee!), power delivered to load nearly 1/10W, total power is exactly 1/10W, the voltage is up to 9.900V (only 0.1V lost in the generator) and the transfer efficiency, K, is a great big 99%. This is the kind of setup the power company has. They are not interested in maximum power transfer, but maximum transfer efficiency. For this reason they use big generators and run them conservatively. Line 1 is the telephone company case. They *must* have minimum reflections and the power transferred is important. The actual power involved is tiny, so they are happy with 50% transfer efficiency – it's a cheap price for what they accomplish.

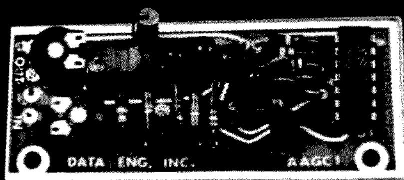
Here comes the sticky part in line five. Here we use 11Ω load. Theory tells us we should transfer just a little less power from the generator to the load, and that the efficiency should be a little less. And so it proves; the current I is a little less, but the voltage E is a little more – how *about* that? – won't they average out? – no, the delivered power is 2.497W for a K of 43.28%.

The last line tells the same story in different words; with a load of 9Ω, the current is higher and the voltage is lower, and the delivered power is 2.493W, with a K of 47.61%.

Mathematicians would sniff at proof like this – it really does take higher math to rigorously prove the proposition. But we all know instinctively that the power actually *does* peak at 10Ω, and that if you mismatch the load even the smallest amount, the delivered power drops off correspondingly, which is plenty good enough for our present purposes.

How good is your Ohm's law? Could you make up a table like this one to explain a different but similar case to someone else? Reading the values and agreeing with them is not quite the same as working them out. To thoroughly understand this impedance-matching (resistance-matching in this case, same thing) theorem you should be able to do all the pencil work too.

NEW



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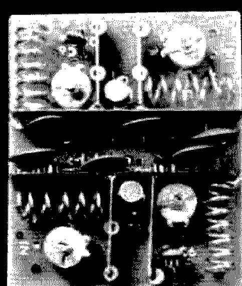

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220 MHz	Single	17 dB	2.5 dB	$9.50	$12.50
220 MHz	Double	35 dB	2.5 dB	$18.50	$24.50
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I is easy – it is equal to Rt divided into 10, the generator voltage. Don't let this confuse you – the generator 10Ω and 10V are equal by coincidence. Pl is I x I times the load resistance. How do you get E? Ohm's law again; I times Rl will do it in one step. If K puzzles you, it is simply Pl divided by Pt and can be expressed as a decimal, or more impressively, as a percentage. Unfortunately, the only way to do arithmetic is to *do* it. Shortcuts are mostly longer, unless you are wholesaling, such as when you make up a table.

Another case of deliberate mismatching is employed in some filters. You don't know how much the filter is actually mismatched, of course. But the designers have discovered that if the mismatch is exactly the right amount, the cutoff points are much sharper, and it works better all around. So they specify the in and out impedances they want you to use, and you use them. It is not wise to deviate here if you expect results.

One last case: Sometimes an audio amplifier must work into a specified load for lowest distortion. Look up any big output triode in your tube manual – you will find, under Class A conditions, that all output triodes work into a load impedance of twice their own plate impedance.

The reason is that as the load impedance is raised from equal to, to twice the plate impedance, the output delivered to the load goes down slowly, while the distortion goes down pretty rapidly. The two-to-one mismatch represents about the best compromise. At this value, the distortion is only about 5%. However, this is mostly even order stuff, which means that you can get rid of most of that by going to push-pull. But even single-ended amplifiers sounded pretty good, without reverse feedback or filtering or fooling around.

The pentodes had a lot more gain, which eliminated a stage and made the amplifiers simpler. Besides, they were the latest thing!

So this is the story of impedance matching and mismatching. If someone insists that impedances must always be matched evermore by Divine Law, be gentle with him. Why destroy his illusions? He won't believe you anyhow, unless he really wants to know.

. . .WB2PAP

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Simplified and inexpensive motor-operated remote control of tuning and provision for remote reflected power monitoring are features of this coupler. The ideas presented can be applied to a variety of situations where remote control and band-switching of an antenna coupler unit is desired while utilizing only a single pair control cable for all remote control functions.

Instead of running resonant feedlines or the end of a voltage-feed antenna into the shack, it would generally be better to have the coupler used remotely located and controlled. In many instances, this would avoid most of the problems of rf in the shack and possibly permit a more optimum placement of the radiating portion of the antenna system. In apartment situations, it may also prevent TVI/BCI difficulties due to being able to use a coaxial transmission line to the remotely located coupler.

Many schemes have been developed for the remote control of antenna couplers. One can get involved with expensive motors, special relays, elaborate control circuits and the need for multi-conductor control cables. The coupler described, however, uses inexpensive components that really make it only slightly more expensive than a regular antenna coupler. The coupler is shown built for dual band operation, but the ideas used can be incorporated into more elaborate designs as required to fit a specific need.

Basic Scheme

The functional units comprising the coupler are shown in Fig. 1. The coupler itself contains a matching network with motor controlled tuning. The motor tuning is also arranged to provide a switching function. The reflected power sensor is simply half an in-line SWR meter. One could use an SWR meter located at the transmitter to indicate the effect of tuning the coupler but a reflected power indication directly between the coupler and transmission line is much more accurate. It is also generally easier to use than a field-strength type indicator when tuning. The indicator voltage from the reflected power sensing unit and the dc control voltage for the motor are both transferred over a shielded 2 conductor cable which is completely independent of the transmission line. The motor itself is a dc

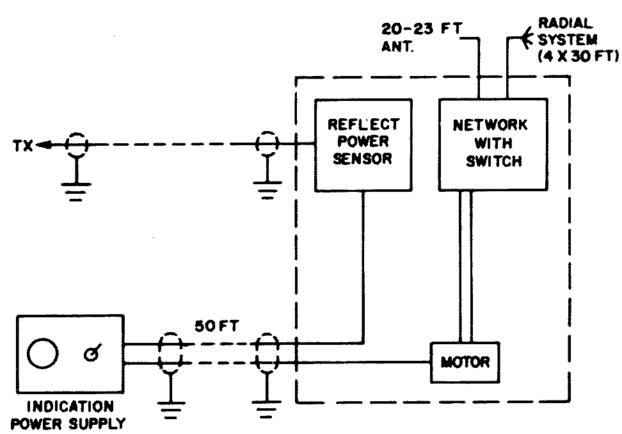


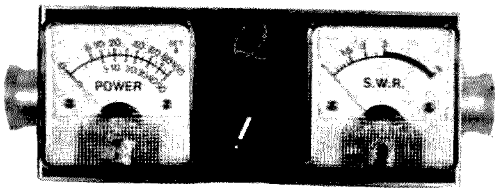
Fig. 1. Basic components of the dual-band remote antenna coupler system.

type and the direction of rotation is controlled simply by changing the polarity of the motor voltage supply.

Coupler Unit

The coupler unit circuit is shown in Fig. 2. The unit was designed for use with about a 20 foot rod antenna on 80 and 40 meters. As was mentioned before, the basic scheme shown can be used with many coupler arrangements. However, one should be sure first that the coupler will properly tune manually with a given antenna before any attempt is made to control it remotely.

As shown in Fig. 2, the transmission line is link coupled to the loading coil. On 80 meters the variable capacitor is used to



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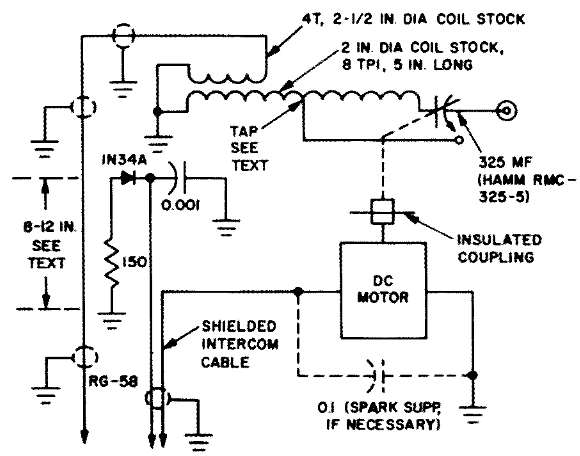


Fig. 2. Diagram of the remote antenna coupler.

allow tuning of the series resonant antenna/loading coil circuit across the band. For operation on 40 meters, the variable capacitor is placed on minimum capacitance. In this position, the rotor plate mates with a contact placed on the capacitor frame, and part of the loading coil is shorted out. The slower change in reactance across the 40 meter band allows operation over most of the band without the need for additional tuning. The dc motor is coupled to the capacitor by means of an insulated coupling.

The reflected power sensor is formed as part of the transmission line. The pickup

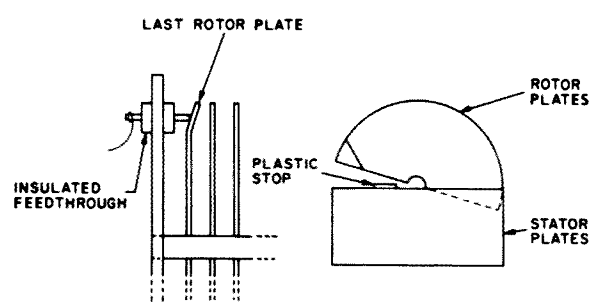
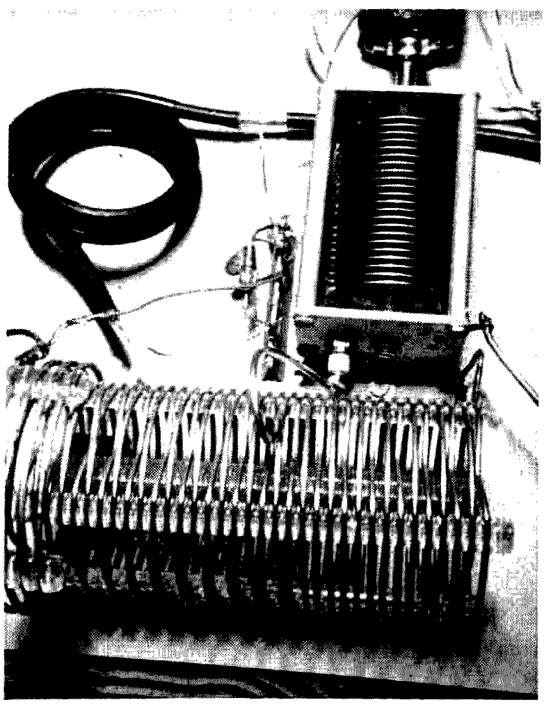


Fig. 3. Details of capacitor switch top view (A) and back view (B). Feedthrough is placed in capacitor back frame such that rotor plate makes contact with plates almost fully disengaged from stator plates.

link is made somewhat longer than usual in order to develop a reasonable current over the control cable back to the indicator unit in the shack. The unit is not designed to read the actual SWR, although this can be done if one calibrates the system initially with dummy load resistor simulating different SWRs. Assuming that the SWR was checked initially using a calibrated SWR meter, the

reflected power indicator is only used to set the motor driven variable capacitor for minimum reflected power at any given operating frequency. If one does, however,



Remote Coupler Construction

The main coil is shown in the foreground with the link on the left. The feedthrough used for COR switching can partially be seen on the backframe of the variable capacitor. The coiled coax on the left forms the reflected power sensing unit with the components mounted on the terminal strip.

also use an SWR in the transmission line by the transmitter, there is a possibility of having a means available to continuously monitor the condition of the entire transmission line/antenna system. For any reference setting of the forward power indicator on the SWR meter by the transmitter, the same reference reading from the reflected power sensor in the coupler unit should be obtained as long as all components remain in good condition.

Coupler Unit Constructor

The photograph shows the general layout used for placement of the components on an approximate 8" square of wood which was placed in a slightly larger wooden enclosure. There is nothing critical about the construction as long as one keeps the variable capacitor insulated. A small metal enclosure

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could be used just as well by placing the capacitor or standoff insulators. The motor shaft is connected to the capacitor by an insulated coupling which fortunately mated the 1/4" capacitor shaft and the approximate 1/8" motor shaft. Actually, a small piece of dowel with appropriate size holes drilled in each end and the use of epoxy cement will work just as well. The motor used was a "junk box" item which works on 12V dc and with internal gearing, and the friction provided by the capacitor results in a very slow tuning rate. Surplus and hobbyist outlets are sources for suitable motors.

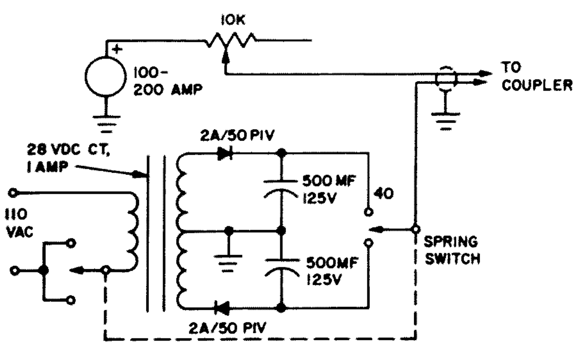

Fig. 4. Diagram of indicator/power supply unit. Batteries may also be used to power most small dc motors.

Almost any intermittent duty 12–24V dc type that has been geared down to 50 rpm or less will work.

The rotor plate on the capacitor nearest the back frame of the capacitor is bent slightly, as shown in Fig. 3, to form a sliding switch contact with one end of a chassis feed-through insulator mounted on the capacitor back-frame. A miniature chassis type feed-through such as USECO no. 1432 is used. Any small piece of plastic may be used as a stop to prevent further rotation of the rotor plates once the switch is engaged by placing it across the stator plates on the same side as the switch (see Fig. 3). Epoxy cement should be used to secure the top.

The reflected power sensor is constructed by carefully slitting the jacket away for about 8–12" at the end of the coaxial cable to be connected to the link. A length of #20 enamelled wire is then manipulated under the shield, the ends being connected as shown in Fig. 2. The jacket is then replaced

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and the length of cable coiled together, if necessary, for compactness to fit the enclosure. The few components for the sensor are assembled on a terminal strip.

Indicator Unit

The indicator units contain only a microammeter and potentiometer as a reflected power indicator and a dual polarity source for the tuning motor. Batteries may be used for the latter function, although a small ac supply is shown in Fig. 4. Some overvoltage from the supply must be available in order to account for the drop in the control cable.

Adjustment and Operation

As was mentioned before, one should be sure first that a coupler operates properly manually before an attempt is made to remotely control the unit. In the case of the unit described, the numbers of turns in the

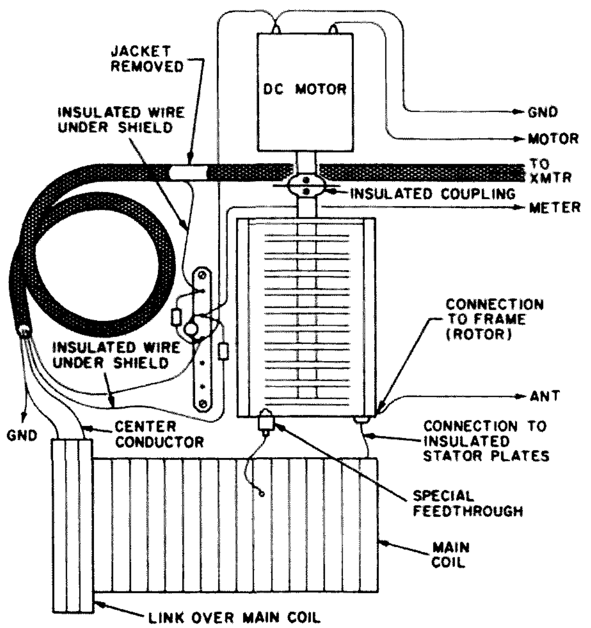

Fig. 5. Sketch of parts layout for dual band coupler.

main coil was established by trimming the coil on 80 meters and checking the frequency range of operation possible and the variable capacitor. On 40 meters, the capacitor switch was engaged and the coil top on the main coil established. These tests were done with a conventional SWR connected in the transmission line immediately before the coupler which was mounted in its operating position. Simultaneously, operation of the reflected power sensor was checked to see that minimum output from it corresponded to minimum reflected power indication on the conventional SWR meter. Operation of the motor should be checked with a length of cable equal to that actually used for the control cable. This is necessary to insure that the voltage drop in the cable is not enough to affect motor torque.

Operation of the unit is not complicated, but it does require a little practice since its simple design does not provide for automatic motor cutoff or signalling of motor position. By observing the speed of motor rotation, one can learn to anticipate when a complete revolution has been made. One position of the control switch on the indicator unit should be marked "40" (or something similar) to indicate one extreme position of the capacitor. Then if one loses an idea of the capacitor position, one can always return to this reference point. Alternatively, if one doesn't require the idea of the capacitor switch for bandswitching purposes, it can be used to activate a pilot lamp over the control line. This might in some cases prevent holding the motor against its stop for a prolonged period and drawing excessive current which could possibly damage the motor. A motor with an internal clutch arrangement can, of course, also be used to prevent this possibility.

In general, there is no great problem when tuning an antenna with a transmitter since the reflected power indication at resonance is clear. This is not the case if one uses an antenna only for receiving. Under fading conditions, it is often very difficult to determine proper resonance of a remote tuner by observing a received signal level.

Summary

The coupler shown was used with low power equipment – up to about 100/150 watts. For higher power levels, an increase in the coil wire size, the insulation path between the motor and capacitor shafts and the spacing of the capacitor plates will probably be necessary. The latter, meaning a larger capacitor, will probably also require a heavier motor. Nonetheless, the basic construction can be modified as necessary for any power level.

. . .W2EEY

F. J. Bauer, Jr. W6FPO
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A PRACTICAL GROUND SYSTEM FOR 160

Ground systems for 160 may be anything from a simple cold water pipe "connection" to an elaborate system of buried copper radials, second in performance only to a salt water marsh. For obvious reasons, such an ideal ground is impractical for most of us, so this poses the question of how good can a "make do" ground system really be? This problem came up while experimenting with a vertical antenna for 160, which is a quarter wave radiator normally working against ground.

First we needed something with which to compare our ground system. Since we had no "ideal" ground system available, it was decided to compare the antenna current when working against ground to the current obtained when working the antenna against a single wire counterpoise. The radiation pattern was of no concern – only the antenna current was measured at the same point in the antenna for both conditions.

First the antenna was grid dipped, using a cold water pipe ground. The resonant frequency was noted and a single horizontal wire was adjusted in length until the antenna resonated at the same frequency as with the ground connection; in the writer's case, 1990 kHz.

The transmitter was next loaded into the antenna first using the counterpoise and then using the cold water pipe with the following results:

	ANT. I
COUNTERPOISE	1.3A
WATER PIPE GROUND	0.5A

Care was taken to keep the final plate load the same for both conditions. From the above it is obvious that our ground is wasting a lot of rf.

A multiple ground system was tried next. This consisted of three 8 foot ground rods spaced approximately ten feet apart and two cold water pipe connections also spaced ten feet apart. The results were as follows:

GROUND SYSTEM	ANT. I
1 water pipe	0.5A
2 water pipes	0.7A
each ground rod	0.6A
2 ground rods	0.85A
3 ground rods	0.95A
combining grounds	1.15A

This compares very favorably with the antenna curent obtained with the counterpoise and it can be assumed that the ground system is just about as good as the counterpoise wire as far as losses are concerned.

The soil at this location is largely decomposed granite – not particularly low resistance without benefit of rock salt or copper sulphate treatment. After the above experiment, we decided against treating the soil and, much to our surprise, the antenna current varied only about 10% from wet to dry seasons. The two ground lead configurations used are shown in Fig. 1. As a matter of passing interest, configuration (a) resonated the antenna 75 kHz lower in frequency than configuration (b). Configuration (b) was finally decided upon at this station, since it was assumed that less "antenna effect" was present becuase of the higher resonant frequency.

. . .W6FPO

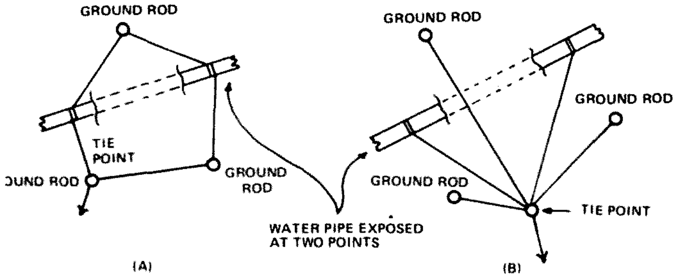

Fig. 1. Ground lead configurations. With a given antenna, (a) results in a lower frequency than (b).

WIDE-RANGE ANTENNA TUNER

George Cousins VE1TG
R.R. 2 Box 18
Lower Sackville, N.S., Canada

Most modern ham rigs are designed with single-ended outputs for direct connection to coax-fed antennas, but there are still many cases where a good wide-range antenna tuner can be very valuable. The most obvious are:

1. To couple the transmitter to any one of the wide variety of antennas which require high impedance feedlines, such as V-beams, rhombics, Lazy H's, Zepps, folded dipoles, etc. This is especially important when the QTH will not allow the erection of several antennas, and the use of a wire antenna and tuner will permit multiband operation.

2. In moderate to severe cases of TVI, where the high harmonic attenuation of the tuner will be of considerable assistance.

3. To permit optimum coupling between the antenna feedline and the *receiver*, an advantage which seems to get little attention.

The tuner can be built in a variety of ways, using circuits which have proved to be reliable over the years. However, to be as useful as possible, the tuner should be capable of either series or parallel tuning, and should be continuously useful over the entire 3–30 MHz range. All controls should be operated from the front panel, and no bandswitching, coil changing, or coil tapping should be required. The tuner to be described satisfies these requirements, and is also a neat, good-looking addition to any station. This particular model was built by Bill Shearman, VE1AX, for use of both amateur and commercial marine frequencies.

The general circuit arrangement is known as a "Z-match" and has been well

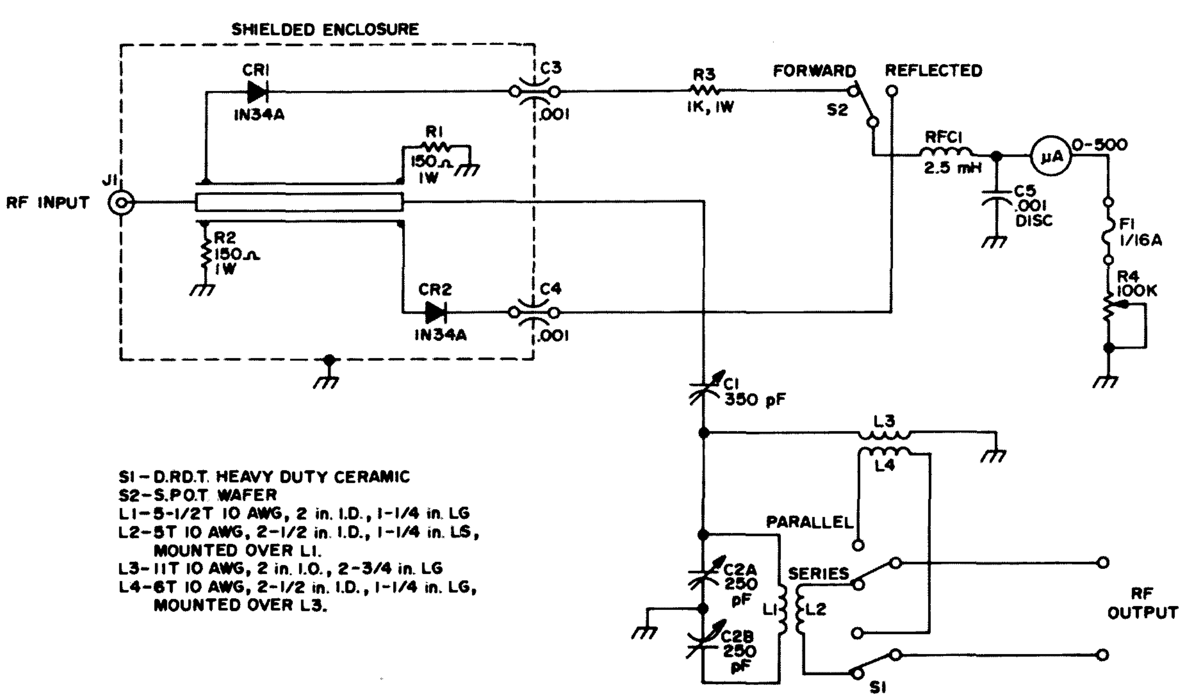

Fig. 1. Overall schematic of the tuner.

known for many years. Two coils are used in conjunction with a split-stator capacitor to cover two frequency ranges at the same time. This allows a smooth transition from series to parallel tuning and no bandswitch is required. An SWR bridge is incorporated, and is in the input line at all times, making tuneup a simple matter.

The tuner is built on a 10 x 17 x 3 in. chassis, with an 8½ x 19 in. front panel. Depending upon the power range of the station transmitter, smaller components could be used and thus reduce the size of the chassis. However, the unit shown will safely handle more than the legal limit on all bands and modes.

A close study of the photos and schematics will reveal most of the construction features. The input coaxial line is first routed through the small shielded enclosure used for the rf components of the SWR bridge. This will be described later. From this enclosure, the line is connected to the variable coupling capacitor C1, which must be insulated from the chassis and panel. A small vernier dial drives this capacitor through an insulated coupling and provides smooth control. (To aid in setting the tuner to the proper tuning point during rapid band changing, calibrated vernier dials are used on both capacitors along with a tuning chart on the front panel.)

The main tuning capacitor, C2A and C2B, is mounted parallel to C1, but *not* insulated from the chassis. A heavy-duty, two-pole, two-position ceramic switch (S1) is mounted on the front panel directly under the two large feedthrough insulators. The two coils are mounted at right angles to each other between C2 and S1 and are supported by their own leads. Commercial air-wound coil stock was used in this model, which made this method of mounting quite feasible. However, homebrew coils should be wound on ceramic forms and firmly mounted.

The SWR bridge is built in two sections, one containing the rf pickup, diodes, and matching resistors, and enclosed in the metal shell at the rear of the chassis, underneath. A small piece of terminal board holds the components associated with the meter, and the meter itself is mounted on the front panel, flanked by the sensitivity control R4 and the FORWARD-REFLECTED switch (S2).

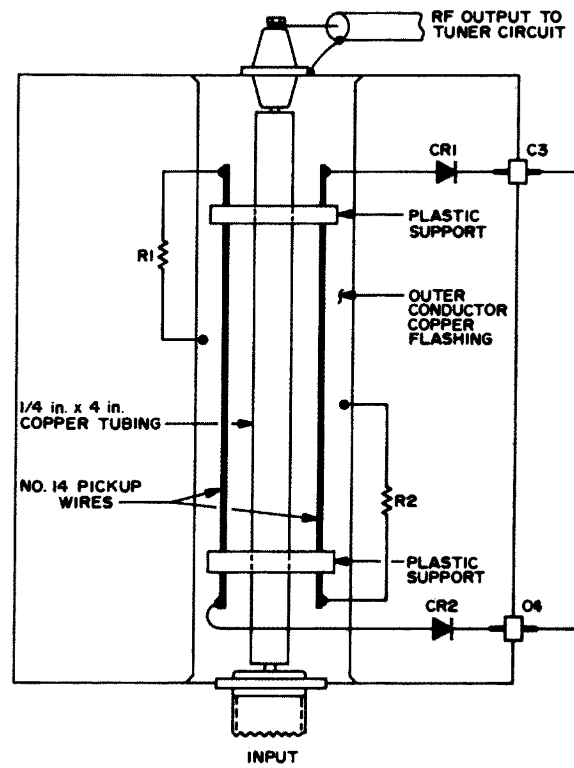

Fig. 2. Construction of the SWR bridge. See text for details.

The construction of the rf section of the bridge can be seen from Fig. 2. The inner line conductor is a 4 in. length of ¼ in. copper tubing. The outer line conductor is a flat piece of copper flashing mounted under the tubing and secured to small mounting bolts at each end of the enclosure. Small square pieces of Plexiglas are used to separate the two conductors, with the tubing being inserted in holes drilled in the center of the squares. Small holes are drilled in the outer edges of the squares to hold the two pieces of 14-gage copper wire used for coupling the rf to the diodes. A matching resistor is connected to one end of each pickup wire, and a diode is connected to the opposite end. The resistors are connected to the outer copper conductor, but the diodes are connected to the two small feedthrough capacitors mounted on the wall of the enclosure. Small shielded wires run from these capacitors to the terminal board, then via

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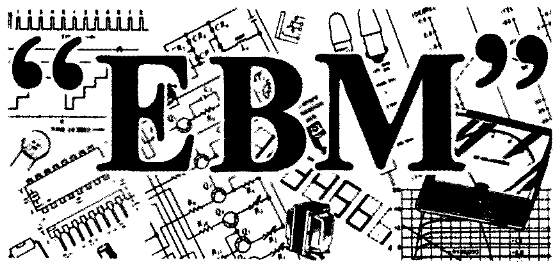

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S2 and the rf filter (RFC1 and C5) to the meter.

Operation of the unit is similar to most tuners: a matter of getting the unit set up

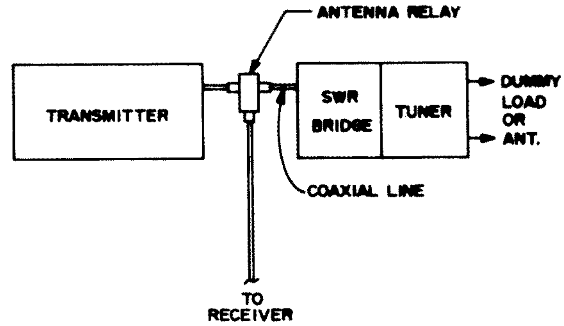

Fig. 3. Proper setup for using the tuner. The coax line to the transmitter may be any reasonable length, and a separate SWR bridge may be used if available.

on each band, and then marking the capacitor dial settings on the panel chart for easy reference. Fig. 3, shows the setup required. With low power fed into the tuner, adjust R4 for full-scale deflection on the meter with S2 in the FORWARD position. Switch S2 to REFLECTED and adjust C1 and C2 to obtain minimum reading on the meter. There is considerable interaction between the capacitors, so make sure they are both set properly and that the SWR is as low as possible. There is also a considerable reaction on the transmitter's plate tuning, so check this often and make sure it is in resonance at all times.

This can be a slow proceeding the first time, so only a small amount of power should be fed into the tuner, and a dummy load should be connected to the output until the settings have been determined. Then a short final adjustment with the antenna connected will suffice. Because there are no bandswitches or coil taps, the setup is very easy to follow and should result in an SWR of 1:1 or very close to it.

The unit was originally built to tune a V-beam feeder, but has also been used on several center-fed 80m dipoles to convert them into all-band antennas, using 300Ω TV ladder-line as the feeder. For the amateur with a space problem, this tuner could be the answer.

...VE1TG■

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OLD ANTENNAS AND NEW BALUNS

Antenna types rejuvenated by the use of toroid baluns.

Anyone who has been in amateur radio for ten to twenty years will remember the days of elaborate "wire" antennas. Newcomers can also glance in some of the old antenna manuals and find them replete with "wire" antenna designs. Wire antennas as the name indicates, are simply more elaborate antenna forms than a simple dipole which provide some gain and directivity and which were usually constructed from wire hung between the necessary supports. The advantages to such antennas was primarily cost, since relatively high gains could be achieved for the cost of additional antenna wire. All sorts of collinear arrays, broadside arrays, curtains, etc., were developed and used successfully. The problems associated with such antennas were many and one of the primary ones was the often awkward feed point impedances of the antenna and the requirement for a balanced feed. Open wire lines had to be used to feed the antennas at impedances ranging from 150–600Ω and then the balanced open wire line converted via an antenna tuner to an unbalanced coaxial feed. For these and other reasons, eleaborate wire antennas have fallen into disuse. Nonetheless, for the amateur who has the necessary space and is primarily interested in working single-band DX, these antennas can provide very good service at minimal cost. Fortunately, the advent of the toroid balun transformers with variable impedance ratios has also eliminated the feed problem once associated with these antennas. The purpose of this article is not to re-present every type of wire antenna array developed. A few examples are given and the use of a toroid balun illustrated. One can, however, glance back in some of the older antenna manuals and magazines and find any number of elaborate wire arrays to which the same feed techniques illustrated here can be applied.

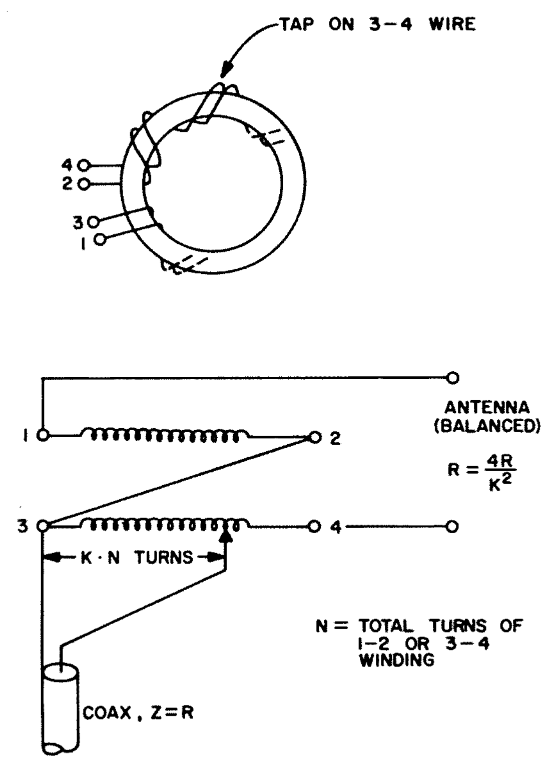

Fig. 1. Variable impedance transformation balun 1:4 to 1:10 or more.

Variable Impedance Toroid Balun

A toroid balun is usually thought of being a 1:1 or 1:4 ratio type unit. That is, going from 50Ω unbalanced to 50Ω balanced or from 75Ω unbalanced to 300Ω balanced. But any toroid balun kit can also be used as a variable impedance balun with transfor-

mation ratios greater than 1:4 possible up to about 1:10. Fig. 1, shows a typical toroid balun winding. The instructions contained in any balun kit can be used to place the initial windings on the toroid core for a 1:4 balun. Note that if the coil tap on the 3–4 winding is placed at point 4, one has a normal 1:4 balun. If, however, this tap is moved closer to the 3 terminals, the transformation ratio of the balun increases according to the formula shown. For instance, if the tap were placed at the quarter way winding point between 3 and 4, that is one quarter of the turns from 3 to 4 away from 4, the transformation ratio would be approximately 1:10. A 50Ω unbalanced input would be transformed to a 500Ω balanced output. In a similar manner, the other tap points can be figured out for any impedance transformation ratio.

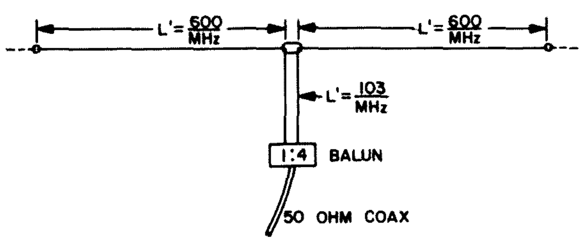

Fig. 2. Extended Double Zepp with balun feed.

Double-Zepp Antenna

The Double-Zepp antennas is a form of extended dipole as shown in Fig. 2, where the dipole elements are made as long as they can be while still having the radiation pattern of the antenna not split up and remain at right angles to the line of the antenna (in and out of the page). The gain achieved is an easy 3 dB. A small phasing section is still required at the center of the antenna, as shown, before the connection of a 1:4 balun.

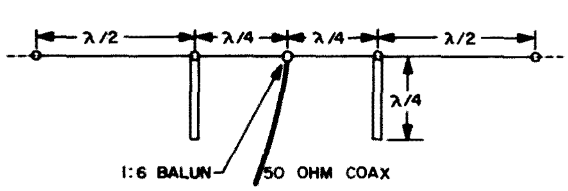

Fig. 3. Classic collinear array balun feed. See text for extending antenna to increase gain.

3/4λ Dipole

The 3/4λ dipole of Fig. 3, also has its main radiation at right angles to the line of the wire and produces 3–4 dB gain. This form of antenna may be somewhat easier to construct than the Double-Zepp since the balun (a 1:6 unit in this case) may be connected directly at the center of the antenna. The phase reversal stubs between the ½λ elements can be made of simple 300Ω twinlead shorted at the far end. The antenna can be extended with another ½λ element on each end (and a ¼λ stub to connect to the adjacent ½λ element) to raise the gain another dB or more. In this case, a 1:10 balun has to be used to feed the antenna.

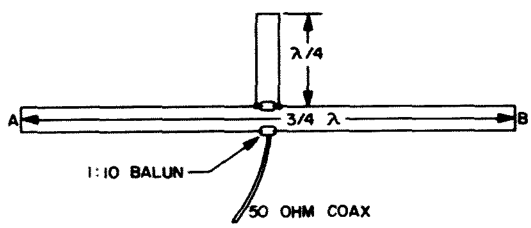

Fig. 4. 3/4λ folded dipole may be operated on two bands if desired by using stub switch.

Dual Band 3/4λ Dipole

The 3/4λ dipole shown in Fig. 4, can be used either as a single band or dual band antenna. Its total length is 3/4λ long at the lowest frequency band used. If used as a single band antenna, the shorted ¼λ stub shown is not required. If it is to be used as a dual band antenna, the stub is made ¼λ long

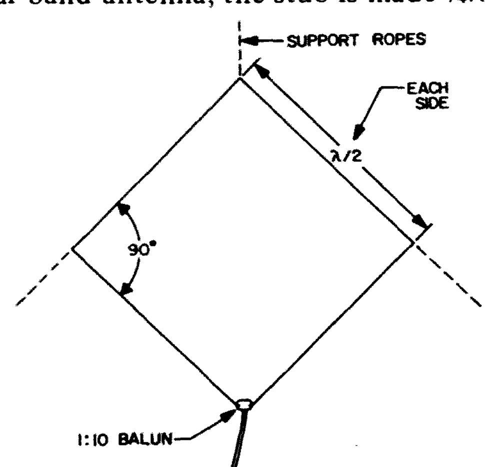

Fig. 5. Super loop or bi-square requires only single support and produces easy 4 dB gain.

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C.L. Peters K4DNJ *DIRECTOR*
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at the lowest frequency band. On the next higher harmonically related band, the stub will act as a short circuit, since it becomes ½λ long, and allow the antenna flat-top to properly resonate. Whether used as a single band or dual band antenna, it can be fed via a 1:10 balun.

Super Loop

The large loop antenna shown in Fig. 5, can be mounted from a tower or other support. Its radiation is horizontally polarized and broadside to the plane of the array (in and out of the page). The gain is about 4 dB in both directions. It can be fed directly from a coaxial line via a 1:10 balun at the base as shown.

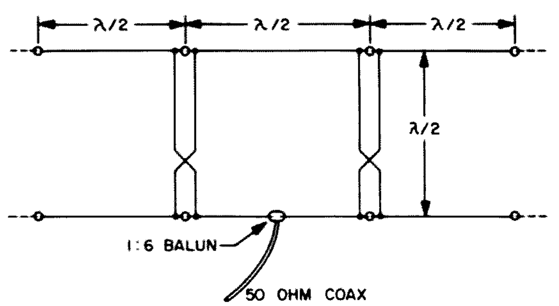

Fig. 6. The six-shooter array provides 7.5 dB of gain. Lower elements should be ¼λ high.

Super Loop

The array of Fig. 6, is just one small example of a curtain array including such types as Sterba, Bruce Arrays, etc. The gain that such arrays can provide become quite significant if one has the space to extend them one to two wavelengths. In this case, the array will provide a broadside gain of 7.5 dB in both directions. The antenna can be fed at the point shown via a 1:6 balun. The phasing line between the upper and lower set of elements can either be open wire line or 300Ω twinlead with a single twist.

Summary

Many other antenna forms which present a resistive impedance on a single band but of an awkward value can be fed via a properly constructed balun. Other antenna types which suggest themselves are V beams, rhombics, half rhombics and single tilted wire antennas.

. . .W2EEY

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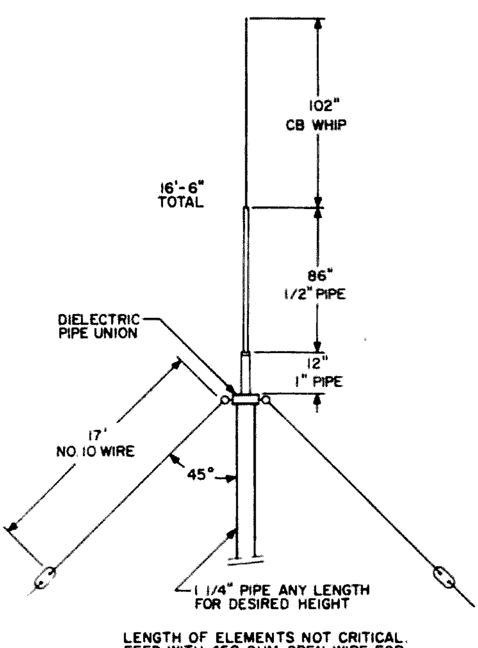
New Washington OH 44854

A MULTIBAND GROUND PLANE

The last time strong winds turned my homemade beam and removed the teeth from the rotor gears, I decided it *was* the last time. My financial situation would not permit procuring a good rotor, so an inexpensive homemade multiband ground plane seemed like the answer. Having had good luck with a water pipe as an antenna element and a dielectric pipe union as an insulator, I tried my luck at a plumber's ground plane.

The antenna is simple to construct, with a little plumbing ability or help. The top section is an old CB whip antenna. These are easy to come by. The whip is bolted to a one-half inch pipe cap by drilling a 3/8 inch hole in the center of the cap. This assembly is installed on an 86 inch section of one-half inch pipe. A coupler from one-half inch to one inch pipe is used to add the remaining 12 inch section of one inch pipe. The overall length of the vertical section is about 16 feet, but length is not critical.



LENGTH OF ELEMENTS NOT CRITICAL. FEED WITH 450 OHM OPEN WIRE FOR USE ON 10, 15, 20 METERS.

Prepare the dielectric union by welding four 3/16 inch eye bolts to it for attachment of the ground radials. I also added small eyes to solder the ends of the radials. Another small eye is welded or soldered to the base of the vertical section for the other side of the 450Ω feed line.

The mast itself is 1¼ inch pipe. The higher it is the better. The plane of the radials must be at least ¼ wave length above ground to be a true ground plane. The radials serve as guy wires and should be at a 45° angle to the mast. TV mast brackets were used to hold the mast to the house. The bottom end of the mast is buried and set on a steel plate. If you add some good all-weather paint, the antenna will stand for years.

By feeding the antenna with 450Ω open wire and using a match box and a swr indicator, this antenna will do a fine job on 15, 10 and 20 meters. My SWR is less than 1.3 to 1 on these bands and the antenna can be used on 40 meters with an SWR of only 3 to 1.

. . .WA8IYL

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500 23rd Street, NW #B-401
Washington, D.C. 20037

MOD QUAD FOR FRUSTRATED CLIFF DWELLERS

If your landlord won't believe that that tower is actually a priceless Picasso sculpture – then read on . . .

This is another answer for the ham who has a luxury apartment complete with everything except permission to erect antennas on the roof or to run wires on the building exterior. The idea was born when I saw my clandestinely mounted mobile whip hauled down from the roof of my 12-story building, and 100 feet of my RG-58/AU feedline tossed to the sidewalk with a warning from the apartment manager. It was almost enough to drive a reborn ham off the air, but not quite enough.

I already knew that most makeshift antennas inside steel - reinforced concrete buildings are pretty poor rf radiators, and they are difficult to load without a good antenna matching unit. Even a shortened helical groundplane on a veranda suffers from inductance and capacitance effects of steel reinforcing and iron railings. At least, I couldn't make it work acceptably in my apartment.

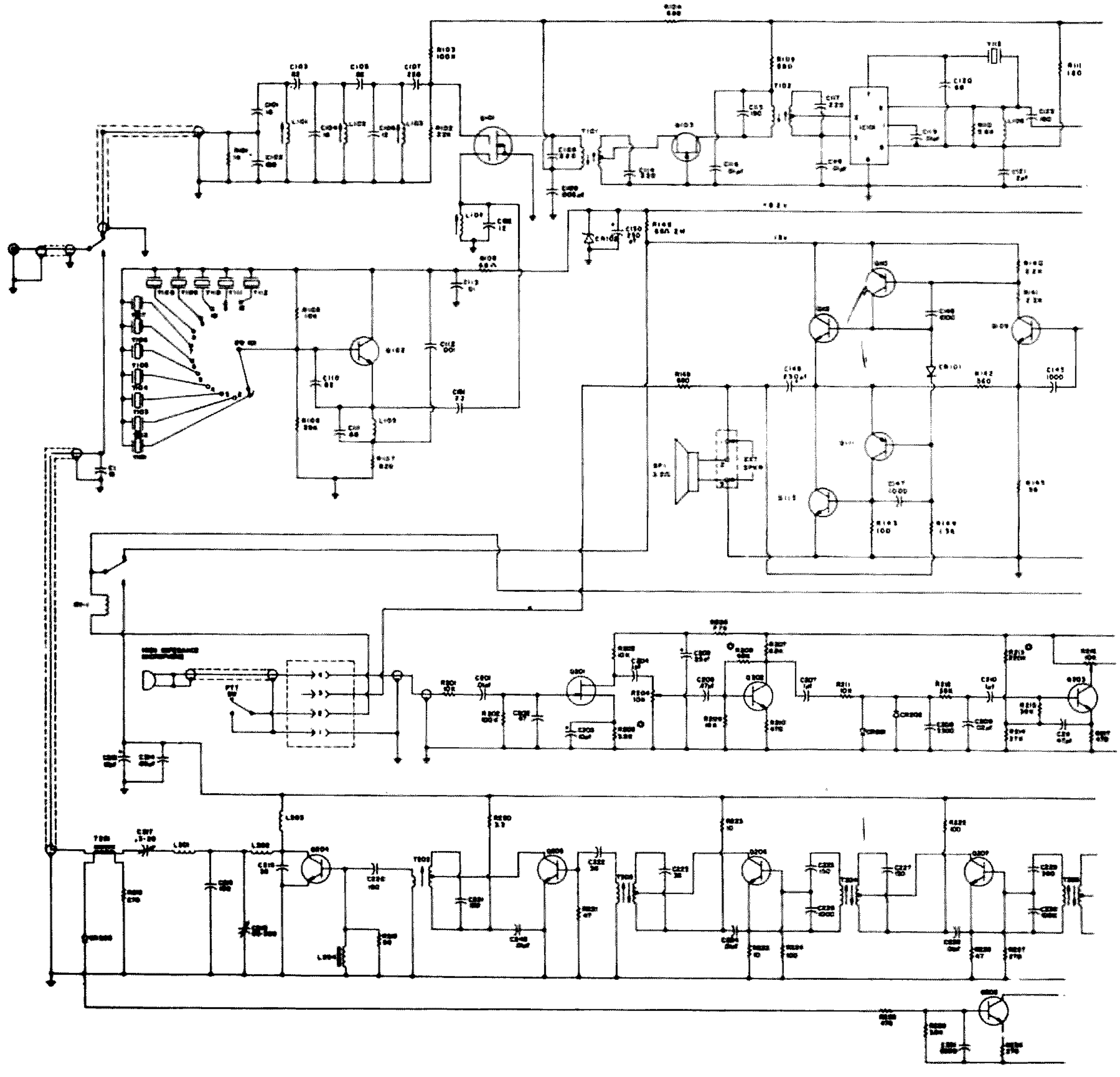
My experience with quad antennas in South America and Asia, however, had impressed me with the quad's ability to perform well near obstructions, so I decided to try some kind of modified quad on my balcony within the physical space limitations, the building regulations, and the XYL house rules.

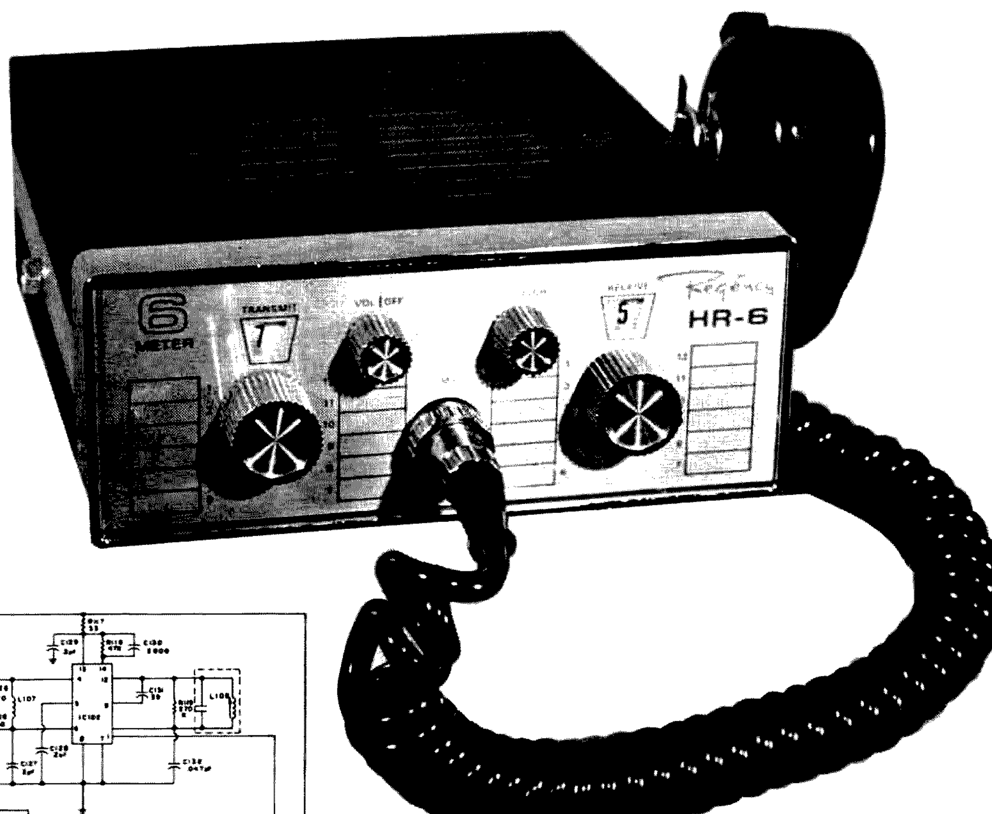
Many unsuccessful experiments and trials led me finally to the happy answer: a one-element rectangular quad using the metal porch door frame for a reflector. Its worth is attested by more than 200 CW novice contacts up to 5000 miles in distance, including 30 states and 22 foreign countries, all on the 15 meter novice band with my NCX-5 throttled back to a legal 70 watts input.

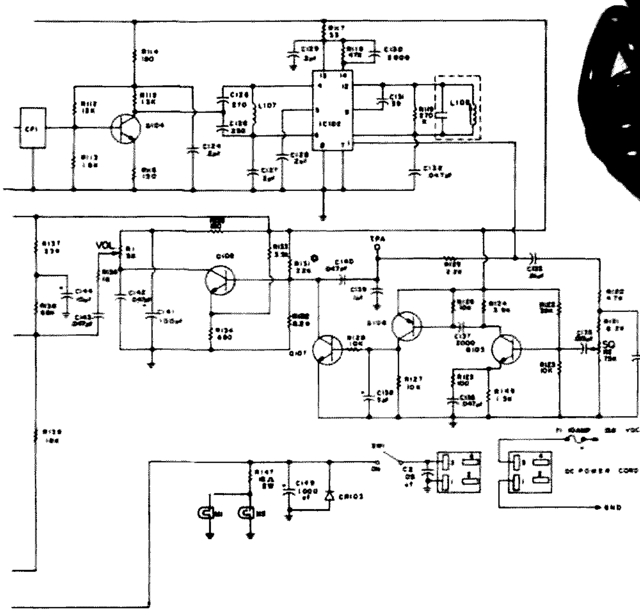
I am unable to explain the radiation pattern of my Mod Quad. While my balcony faces east and the quad loop is wholly or partially shielded in other directions, nevertheless I get good reports from almost all around the azimuth circle, as if the radiator were a half-wave vertical in the clear. Several hams have told me of similar radiation

Schematic Of The Month

REGENCY HR-6







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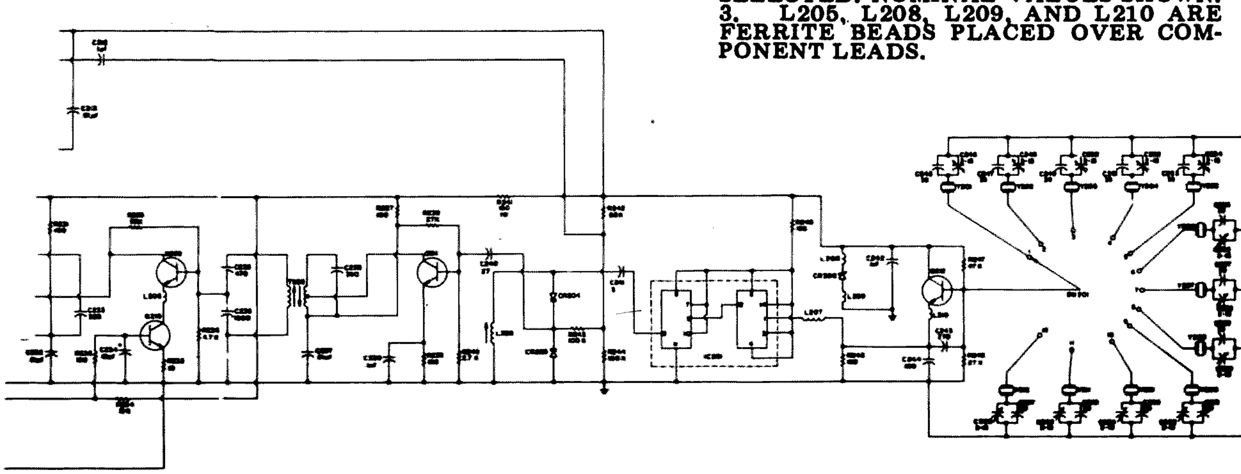
2. * NOTED VALUES ARE FACTORY SELECTED. NOMINAL VALUES SHOWN.
3. L205, L208, L209, AND L210 ARE FERRITE BEADS PLACED OVER COMPONENT LEADS.



AMSAT NEWS

Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

"Space Science Involvement" a 64-page curriculum supplement intended for secondary school teachers, is now available from ARRL Headquarters. Produced by educators at the Talcott Mountain Science Center, Avon CN under contract from AMSAT, this curriculum source material illustrates how AMSAT-OSCAR 6 can be used as a classroom instructional tool.

For your free copy of the book write: Bill Dunkerley, c/o ARRL, 225 Main Street, Newington CN 06111. Be sure to specify how and where you expect to use OSCAR 6 for educational purposes.

The OSCAR 7, two 10m repeater passbands (±3dB points) are: UPLINK 145.850-145.950 MHz DOWNLINK 29.40-29.50 MHz, BEACON 29.50 MHz.

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Orbital Information

Orbit	Date (Jun)	Time (GMT)	Longitude of Eq. Crossing °W
7430	1	0039.2	57.6
7443	2	0134.1	71.3
7455	3	0034.1	56.3
7468	4	0129.0	70.0
7480	5	0028.9	55.0
7493	6	0123.9	68.8
7505	7	0023.8	53.7
7518	8	0118.7	67.5
7530	9	0018.7	52.5
7543	10	0113.6	66.2
7555	11	0013.5	51.2
7568	12	0108.4	64.9
7580	13	0008.4	49.9
7593	14	0103.3	63.6
7605	15	0003.2	48.6
7618	16	0058.2	62.3
7631	17	0153.1	76.1
7643	18	0053.0	61.1
7656	19	0148.0	74.8
7668	20	0047.9	59.8
7681	21	0142.8	73.5
7693	22	0042.8	58.5
7706	23	0137.7	72.2
7718	24	0037.6	57.2
7731	25	0132.6	70.9
7743	26	0032.5	55.9
7756	27	0127.4	69.7
7768	28	0027.4	54.6
7781	29	0122.3	68.4
7793	30	0022.2	53.4

The TRAVELING Ham

Joe Kasser G3ZCZ
1701 East West Highway, Apt. 205
Silver Spring MD 20910

When I was writing about the repeaters in the Pittsburgh area, back in the February column, I apparently forgot to mention the 22/82 Repeater. K3ISO wrote in to tell me about WR3ACH. This repeater is accessible on the turnpike from mile marker 30 (west of Warrendale) to mile marker 100 (between Somerset and Donegal). Mobile coverage of the greater Pittsburgh area lies within a 35 mile radius of Churchill Borough, however when driving in that area, one is either in the valley or on the top of a hill so that signals can get noisy at times. The equipment consists of Motorola Sensicon Receiver and Transmitter Strips with homebrew power supplies. The IDer, timer and six cavity duplexer are also homebrew. 25W of rf is fed to the four pole antenna for about 100W of erp. The reason that WR3ACH did not get a mention in the column was probably because I didn't have 22/82 in the rig at the time, after all there is a limit to how many pairs of crystals one can put into any one rig at any one time.

A few miles from Pittsburgh in Philadelphia there is a 19/79 repeater. The repeater has wide coverage over the southern part of New Jersey and features a free autopatch or local calls. Access to the autopatch is by the use of the * button on the touchtone pad, while disconnect is achieved by means of the # button. Since everything between * and # is recorded, please, if you use the autopatch, identify before and after and during the call.

Mobile VHF activity in the USA seems to be 99.9% FM. That is not so over in England. There, 2m SSB is also popular and is helped by readily available commercial Japanese rigs. These rigs feature channelized communications (10 kHz) with VFO tuning to get in between the 10 kHz points. Commercially made transverters also exist for base station use, and the resulting simplex range well exceeds that of FM. The rig is called the Liner 2. A somewhat similar rig is advertised in the USA for 6m use. That does not mean that FM is not popular, one repeater has been on the air for over a year now, and more are planned. There is a lot of simplex activity as well as I found when I was in London for a very brief stay in January.

Prices of ham equipment in England are very different to those in the USA, for example: Yaesu FT 101B $649, in the US. It is S760 in the UK. 2m FM crystals, $3.75 in US, $8.20 in the UK. Robot SSTV monitor – $295 as compared to $506 over there, and so on. One day it will be interesting to compare the cost of ten popular pieces of ham gear in different countries, then compare salaries, and see for example how many hours of work are required to purchase a Flibber 450 DX special.

VK3ZML wrote in with some up-to-date information on the Australian scene. For the latest information write: Wireless Institute of Australia, P.O. Box 150, Toorak, Victoria 3142, or telephone (03)-248-6521 in Melbourne, (02)-435-7951 in Sydney, (08)-261-4814 in Adelaide or (072)-48-6142 in Brisbane. He also passes on a list of repeaters as follows:

Victoria
Bendigo 20/80; Geelong 40/00; Horsham 10/70; Labrobe Valley 20/80; Melbourne 10/70; Mildura 40/00; Mount Macedon (Melbourne) 30/90.

South Australia
Adelaide 40/00;

Western Australia
Perth 10/70;

New South Wales
Gosford 10/70; Newcastle 40/00; Orange 10/70; Sydney 40/00; Woolongong 10/70;

Queensland
Brisbane 40/00; Gold Coast 10/70;

Tasmania
Launceston 40/00;

All repeater channels lie between 146 and 147 MHz. Simplex channels are 145.85, 146.00, 146.15, 146.50 and 146.55 MHz. If you wish to order such nonstandard US channels, I've found that Savoy can supply them within two weeks and that was without any special rush request.

Well, this month we've gone round the world. Keep those letters coming and this column will become even more interesting.

G3ZCZ

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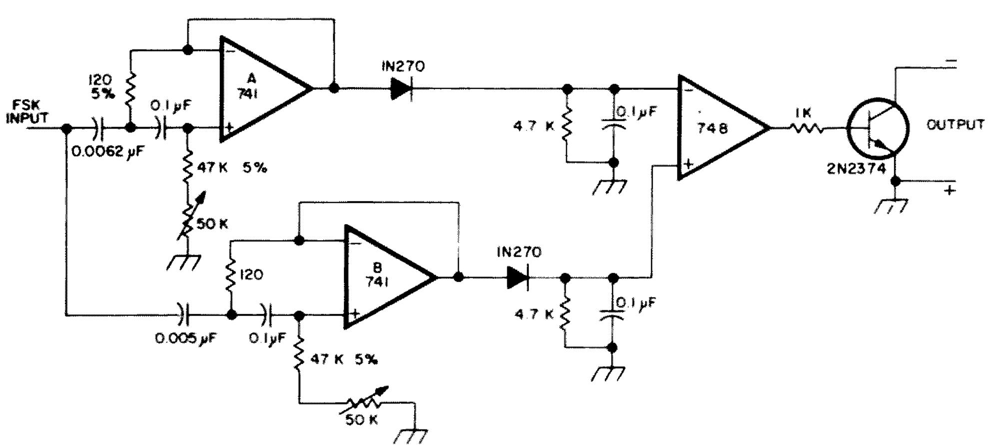

MARK/SPACE DEMODULATOR

FSK demodulator contains 2 active filters, saving space and improving performance over designs that use conventional LC-tuned circuits. Filter A passes the space frequency of 2,025 Hz, while filter B passes the mark frequency of 2,225 Hz. The op amp operates open loop, summing the filter outputs. For a mark input, the output transistor saturates so that circuit loop closes. This circuit works fine on a breadboard. Thanks to F. C. Hervey K4ETZ, for submitting this circuit from the July 19, 1973 issue of Electronics Magazine.

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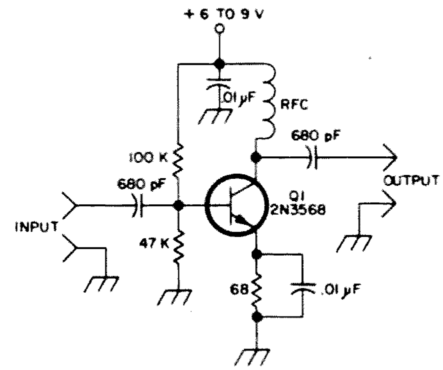
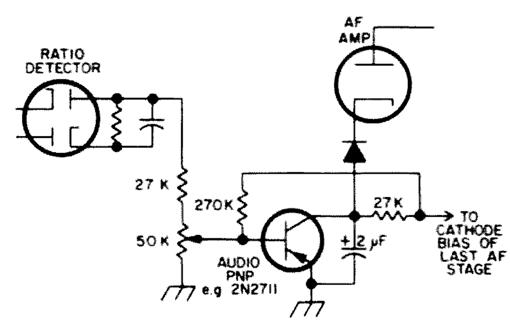


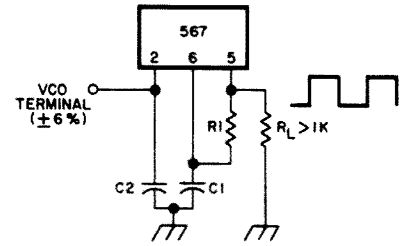
RF PREAMPLIFIER

This unit offers 12 – 15 dB gain on 10m, and about 20dB or more from 15m and down. All leads should be as short as possible. Building it on a PC board should give good results. Q1 can be any type of transistor. The Beta should be around 150+. f_t should be 60MHz or better. Thanks to Mark Chun KH6HPQ, for this circuit.



SIMPLE SQUELCH CIRCUIT

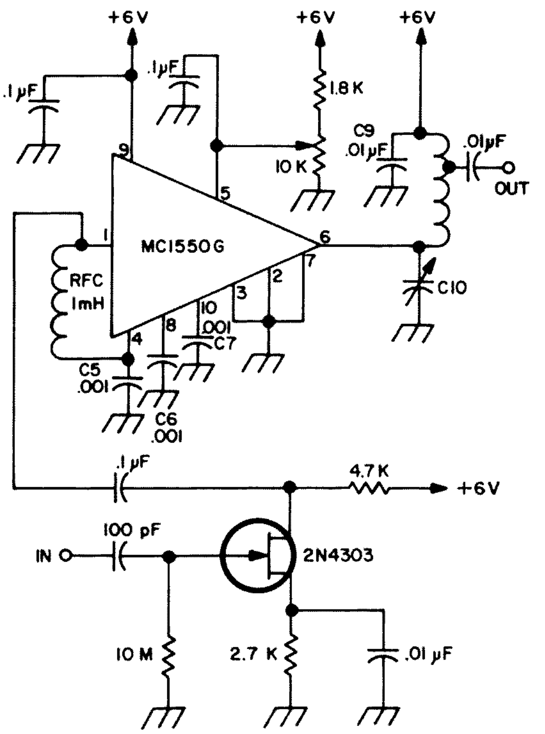
This circuit is for use with a tube FM receiver. The transistor acts as a switch to turn on the first audio stage. Parts not listed are in the receiver. Labled parts are added. Thanks to Lael Nagurney WA3EEC/1, for this circuit.



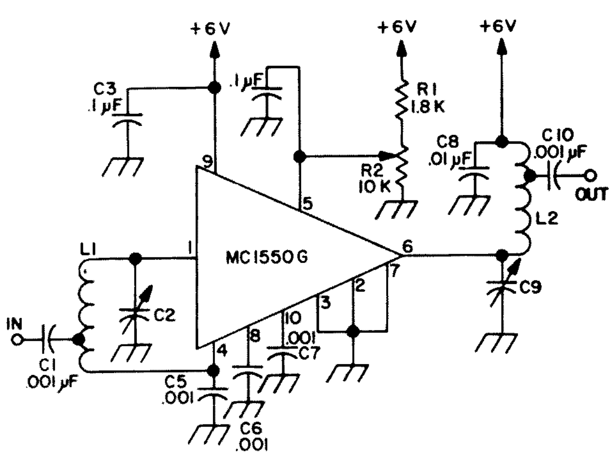
PRECISION OSCILLATOR with 20 nsec SWITCHING

Courtesy of Signetics Catalog

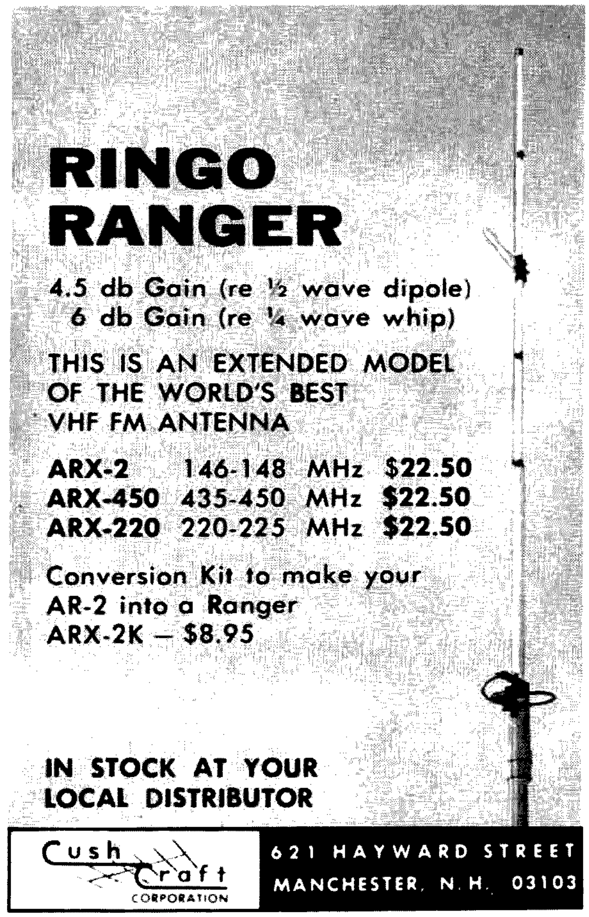
CIRCUITS...



If you cannot install a good big receiving antenna, try this substitute. It adapts the very weak signal from a piece of wire, a lamp post, or a mattress to the common 50-ohm receiver input terminal.



This rf preamplifier is easily adapted to any range under 30 MHz simply by choosing appropriate input and output tuned circuits.



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PROPAGATION CHART

J.H. Nelson

Good (open) Fair (☐) Poor (O)

June 1974

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24	25	26	27	28	29

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	7	7	7	7A
ARGENTINA	14	14	14	7A	7	7	14	14	14	14	14A	14
AUSTRALIA	14	14	7A	7B	7	7	7	7	7	7B	14	14
CANAL ZONE	14	14	14	7	7	7	7A	14	14	14	14	14
ENGLAND	14	7	7	7	7	7	14	14	14	14	14	14
HAWAII	14	14	7A	7B	7	7	7	7	7A	14	14	14
INDIA	7	7B	7B	7B	7B	7B	14	14	14	14	14	7A
JAPAN	14	14	7	7	7	7	7	7	7	7	7	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14	14
PHILIPPINES	14	7	7B	7B	7B	7B	7B	7	7	7	7	14
PUERTO RICO	14	7	7	7	7	7	7	7	7A	14	14	14
SOUTH AFRICA	7	7	3A	7	7B	14	14	14	14	14	7B	7B
U. S. S. R.	7	7	7	7	7	7	7	7	14	14	14	7A
WEST COAST	14	14	7A	7	7	7	7	7	7A	14	14	14

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7	7	7	14
ARGENTINA	14	14	14	14	7	7	7A	14	14	14	14A	14
AUSTRALIA	14	14	14	7A	7	7	7	7	7	7B	14	14
CANAL ZONE	14	14	14	7	7	7	7	14	14	14	14	14
ENGLAND	7A	7	7	7	7	7	7	7	7	7A	14	14
HAWAII	14	14	14	7A	7	7	7	7	7A	14	14	14
INDIA	7A	7	7	7	7B	7B	7B	7	14	14	14	14
JAPAN	14	14	14	7	7	7	7	7	7	7	7	14
MEXICO	14	14	7	7	7	7	7	7	7	7	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	7	7	7	7	14
PUERTO RICO	14	14	14	7	7	7	7	14	14	14	14	14
SOUTH AFRICA	7	7	3A	7	7B	7B	7B	7A	14	14	7	7
U. S. S. R.	7	7	7	7	7	7	7	7	7A	7A	7	7

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7	7	7	7
ARGENTINA	14	14	14	14	7	7	7	7A	14	14	14	14
AUSTRALIA	21	14A	14A	14	14	7	7	7	7	7B	14	14
CANAL ZONE	14	14	14	7	7	7	7	14	14	14	14	14
ENGLAND	7A	7	7	7	7	7	7	7	7	7A	14	14
HAWAII	14	14A	14A	14	14	7A	7	7	7	14	14	14
INDIA	14	14	14	7B	7B	7B	7B	7	7	7	7	14
JAPAN	14	14	14	14	14	7	7	7	7	14	14	14
MEXICO	14	14	7	7	7	7	7	7	7	14	14	14
PHILIPPINES	14	14	14	14	14	7B	7B	7	7	14	14	14
PUERTO RICO	14	14	14	7	7	7	7	14	14	14	14	14
SOUTH AFRICA	7	7	3A	7	7B	7B	7B	7B	7A	14	7A	7
U. S. S. R.	7	7	7	7	7	7	7	7	7A	7	7	7
EAST COAST	14	14	7A	7	7	7	7	7	7A	14	14	14

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

73 magazine
for radio amateurs

$1.00
JULY 1974

73 magazine
for radio amateurs

166 JULY 1974

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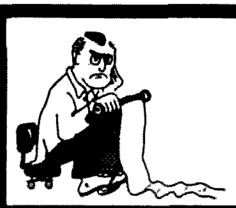


NEVER SAY DIE

...de W2NSD/1

EDITORIAL BY WAYNE GREEN

THE IRS GOAL

The IRS works diligently to make sure that there will be stories in the newspapers, on the radio and on television telling of people who have been convicted of tax fraud – and they try very hard to see that these cases come off just before tax filing time. This is part of the IRS campaign of fear which helps keep taxpayers in line. They orchestrated my trial so the verdict would come out in time for national publicity just before tax return filing time. The IRS, with unlimited funds and the best of legal talent available from the Justice Department in Washington, virtually never loses a case.

IRS WIN?

While I expect that the next issue of Worldradio will headline that Green has been convicted by the IRS of income tax fraud – sentence suspended and probation for three years – the actual story is almost totally hidden by the IRS press release, as you might expect.

The whole purpose of many of the "trials" for tax fraud is to generate articles in the newspapers and magazines at tax time to frighten taxpayers into complete submission. If editors would refuse to give the IRS the PR they want, this whole program would fail and hundreds of people would be spared the trauma every year of being indicted, tried and found guilty of tax evasion – whether they have actually done anything wrong or not – a process that is helping to destroy faith in our government.

Yes, I sat through a trial, listening to a couple of people lie in order to protect themselves, and unable to say anything – to fight back –even to argue. I can see why the Chicago Seven let loose – the temptation was almost overpowering at times. Even so, there was never any testimony or evidence at all that I did anything wrong – nothing was hidden – books weren't altered – I had depended entirely on the accountants to prepare tax returns – I hadn't even read them over as Nixon did (he has a lot of tax expereince – I haven't).

My lawyer felt that since no case had been made against me that we had nothing to worry about so he made virtually no defense or closing statement. Much has been written about having to prove oneself innocent in these courts and I can verify that. Even though the testimony of the accountants was that I depended on them to allocate all business and personal expenses, the jury of my peers (retired postal employees, housewives, etc.) decided that "I should have known that the tax returns weren't right." *GUILTY!*

So we're appealing the case.

There is so much to write about this that there is no way to present the material within the pages of 73. Those who are interested in getting the inside information on how the IRS works – how they defy constitutional protections with impunity – how they can win fraud cases even when the pidgeon is innocent (and they know it), should watch for the first of my books on the IRS.

May I ask that all readers keep your eyes peeled for newspaper clippings of IRS harassments and send them to me. My file is growing and the horror of the story the clippings tell is honestly beyond belief. I shall write this story.

In the meanwhile I am back at my regular stint, working at 73 day and night, and the magazine is doing well. There never was any serious problem as far as the magazine was concerned anyway since our carry-back losses for 1969 and 1970 more than cover any possible tax the IRS could come up with for the previous years. That's about the only benefit there is to losing money – and we did lose a bundle in those two years.

You didn't think the IRS was going to take my pressures on them lying down, did you?

OUT OF ONE POCKET THE IRS GETS THEIR CUT

Have you ever stopped to think of how come government employees have to pay income taxes? Does this make any sense at all?

The government salaries come from taxes collected, like from the income tax. So all that is happening is that Uncle Sam is giving with one hand and taking it back with the other. Unfortunately, the money doesn't just get from one hand to the other without going through a lot of other hands, each a little sticky.

The IRS charges for their collection service. In fact it costs more to keep this den of thieves running than it does the whole postal system, as incredible as that may seem. In point of fact the Treasury (IRS) is the third most costly department of the government, with Defense and Health beating them out on expenses. The Treasury spends over 10% of the total government budget! It costs a lot to take the money from one pocket and put it back in the other when a government bureau is in the middle.

If all government salaries could be made tax free that would result in an immediate reduction of about 20% in the salary overhead of the government, but would reduce the income tax receipts by only about 7%, leaving a substantial net gain.

Considering the cost of the Treasury Department, perhaps more effort should be made to work out an alternative to the income tax. There has to be a more efficient way of paying for government.

DAYTON SMASH HIT! OVER 9000 REGISTERED

Trot out the adjectives – Dayton rated all of them. The exhibitors all went home smiling for most of the 9000 hams who attended the Hamvention brought money and spent it. One distributor claimed to have sold nearly $30,000 worth of merchandise – one chap sold over $3000 in batteries alone – and so it went. Exhibitors remarked that the crowd on Friday alone was better than any other hamfest or convention has been able to turn out for an entire weekend.

Gordon West WB6NOA of Standard Communications took one look at the May Streaker cover and flipped! For that matter, this cover was the center of a lot of attention at Dayton, with fellows turning up every few minutes who had heard about it and wanted to get a copy before they ran out. For those readers who are not sophisticated enough to know a boy from a girl when they see one, the cover was a male type boy, despite the longish hair. Long hair seemed compatible with streaking. The streaking took place right here in Peterborough and the streakee was the brother of one of the lovely gals in the art department.

Gordon was in high humor after hearing how well his SC-R146A HT's were selling through his distributors. They were everywhere and you never heard such a mess as 94 during the Hamvention.

The flea market (above) had over 700 displays and covered over seven acres. Dedicated scroungers were hard put to do the assortment of stuff even on the long weekend.

Wayne W2NSD/8 and Yvette WA8ULU at the 73 booth at Dayton. Subscriptions, code tapes and books all sold extremely well, keeping them busy for the whole weekend.

Bob Brown W2EDN of VHF Engineering had a chance to show and tell his new line of repeaters and his under $100 HT's. The audience at the FM session ate it up.

The three day convention was decidely a success. The complaints were few (there are always *some* complaints) and had to do with a need for better scheduling of tech sessions and an earlier closing on Sunday.

The FM sessions were most helpful in getting everyone up to date on the latest FCC twists and turns – bringing out needs for repeater council cooperation – and a solidifying of agreements on FM and repeater standards.

RESTRUCTURING AMATEUR RADIO

The FCC has a list of 43 petitions for rule making that have piled up – many of them contradictory. They probably have been putting off action on these (some for many years) because the changes which they would make are major ones and call for some basic rethinking of the whole structure of our licenses.

We have six different types of amateur licenses right now. Do we really need that many or can we simplify the structure a bit? Five of these classes have different frequency allocations. Do we really need that many? Should we continue the Technician license as it is – a sort of dead end for two meter FM? Should we open part of 10m for Techs as petitioned by the ARRL? Should we give Novice priviledges to Techs so they can work some CW bands if they want to improve their code as petitioned by me? Should we have more phone bands? Should we get rid of AM on the low bands once and for all? If we do get rid of AM, should we then permit SSB and CW to use any frequencies they want, and go to an agreed sub-band setup rather than an FCC allocated one? How about a Communicator or Hobby class license, perhaps for 220 MHz, as a starter? Perhaps we need a CW Extra and a Phone Extra license setup so phone ops won't have to pass a 20 wpm code test, which seems difficult to rationalize. Is it time to set up a whole new call sign arrangement so amateurs can just about have the call of their choice?

DON'T PANIC

If the FCC has any favorite restructuring plans for us they are keeping it quiet, and I was assured that they do have an open mind about all this and are more interested in the amateurs coming up with a plan that they want than in dumping one of their own making on us. Perhaps the trauma of the repeater license rules is fresh in their minds and they would like to try their best to avoid replaying that one. And in something as emotional as restructuring, the heat generated by Docket 18803 was just a candle next to a blast furnace.

The fact is that a great many amateurs are reactionary – they don't like change and will fight it, bitterly. Since change is inevitable (at least until immortality is discovered), I have always felt that we should accept the fact that there is going to be constant change and try to turn this to our advantage rather than fighting it.

The recent headlines in CQ about restructuring the licenses was not a reflection of FCC intent, but just a bunch of wishful thinking on the part of the magazine, bent more on promoting their own petition than on reporting news. There is a need for a good deal of thinking and planning before the FCC can come up with a notice of rule making – and the FCC is asking that you start working out your ideas for them. I would suggest that you bounce your ideas off the members of your local club before forwarding them to the FCC as this may help to weed out half baked schemes which will create more heat than light.

In case it does not go without saying, the letters pages of 73 are wide open for ideas on license structures and band plans.

CW?

One key concept you'll have to come to grips with has to do with the Morse Code. The present license structure is built around the code and the skill of being able to copy code is the single most important factor holding back advancement in license classes. In view of the almost total lack of use of CW for other than amateur radio, is this still important enough to hold this position?

We don't want to just throw open the gates, so to speak, for the mass input of CBers into amateur radio, complete with their disregard of the rules, which is frightening to consider. And on the other hand, with the number of amateurs steadily dropping, obviously something radical must be done to get things turned around. My own idea is to try to get the ARRL to spend some money (and they have a million dollars just sitting there unused) to get PR for amateur radio – and maybe even to advertise it. I prefer that to debasing the entrance exam because I feel that the less people have to work to get ham licenses, the less they will appreciate them. The Novice ticket is so simple a ten year old can hack it, so why go simpler than that?

I won't cover all of the arguments – you do that – okay?

OTHER PLANS

For argument more than a real proposal, the FCC has come up with an ultra-simple license plan – sort of an answer to CBers who want to get a ham license and talk with their buddies all over the country while sitting back with a cold beer after a day on the assembly line.

Entry
Form 1
Form 2
Universal Class License

(Continued on page 92)

SSTV SCENE

Dave Ingram K4TWJ
Rte. 11, Box 499, Eastwood Vil. 50N
Birmingham AL 35210

A Slow Scan milestone was recently accomplished when Johnny Bjornulf LA2BK, and Knut Gjertsen LA2PH/mm, successfully transmitted and received solid copy color SSTV pictures between Norway and the ship "Thorsage" which was in the South China Sea area. One of their best quality pictures, that of the newborn Prince Haakon Magnus, has appeared in magazines and newspapers throughout the Scandanavian area. Their QSOs were on 20m, and considering the distance involved, was quite a feat for our present band conditions.

Tic-Tac-Toe

On the lighter side of record setting events is W6EYY and WA7QBV's recent on-the-air tic-tac-toe game. Hal and Bob were located too close for a 15m QSO, and WB9GCS, hearing them both, acted as relay in this "3 corner event." No doubt that called for some lights, camera and tape recorder work! Who knows, today's games may point up tomorrow's possibilities.

Killer Tornadoes

The nationwide outbreak of killer tornadoes during April of this year pointed up the need for Slow Scan TV during emergencies. 2m autopatch operations have proved their merit during such times, now consider what an advantage SSTV coverage would be also. Pictures could be relayed back to TV stations, safety officials and newspapers immediately after a tornado, flood, earthquake or whatever. Concerned parties could see immediately the exact situation, and what steps should be instigated. Relief missions would have an idea of what awaited them. Just as 20m provides worldwide coverage, 2m provides local coverage. Obviously SSTV will soon fill this vital need. A camera and monitor would not necessarily need to be carried into the particular area. For example, Polaroid photos could be taken, then carried back a few miles to an SSTV setup. Or, a flying spot scanner might be carried in and the photos put into this. I have worked a couple of fellows mobile using Robot gear, and I'm sure if 15Hz sync lock is a problem, some of you could come up with a simple crystal time base counter for mobile operations. In fact, a SSTV camera is all that's really necessary in this type situation. Once you get familiar with your particular camera, you can practically focus it by the lens calibration (which is not critical for distant shots, compared to "close-ups"). "F" stop adjustments can be "guesstimated" within close accuracy by listening for the swing of the camera's SSTV output on an earphone. Two SSTV operators working together over, say a 2m link, could focus a camera onto a scene within a minute or two; the "fixed" one observing a monitor and the "mobile" adjusting the lens. Sports photographers use a wire "sight" on their cameras for quick view finding. This idea could help you "view find" your SSTV picture easily. Use your imagination and consider these thoughts. SSTV is as useful (or useless) as we make it.

Have you ever noticed those little one dollar battery operated slideviewers, you drop a slide in and it energizes a light for viewing? I couldn't help but think how dandy one of these would be for Slow Scan, so I bought one and mounted it beside my desk where the Robot Camera could be turned to look into it. Now, after marking the camera's lens settings for quick adjustment, the camera may view either the operating area or slides. The real advantage of this little "goodie" is that slides can be transmitted even in a very dim shack. (That's quite handy for tilting and IDs also.) After making a few slides using Datamark Letters, I dropped in some Instamatic 124 negatives and switched the camera to video invert. That worked so well I now use the Instamatic and have negatives only processed. (That is inexpensive enough to be worthwhile.) These little viewers are really hard to beat for a dollar "slide chain."

While on the subject, I might mention it's *definitely best* to place the viewer so the camera stays *horizontal*, not pointed down. Pointing a TV camera down can cause any impurities in the vidicon (or camera tube) to fall on the ultrasensitive target, permanently scratching it thus causing black spots or scratches to appear in all later televised pictures. Keep those camera's horizontal if at all possible!

Dayton

This year's Dayton convention was unquestionably the biggest milestone yet for SSTV. Although last minute problems prevented me from attending, Jerry W4CAH, provided a grand account of activities. The Digital Slow to Fast Scan converter made its debut in fine style. There were 2 or 3 of these scan converters displayed and although each use slightly different circuitry (recent SSTV Scene articles have briefly described these various units), they all use basically the same principle; that of converting a Slow Scan picture into a digital equivalent, loading this into memory, then reading it out of memory at a regular Fast Scan rate. Variations were in methods of loading and unloading. I understand the Fast Scan converted pictures were quite outstanding due to their brightness and persistance. The pictures would appear in the familiar "window shade pull down" fashion for SSTV but less the bright initial trace. Further, newly received pictures erased previously displayed pictures completely on the first "sweep," whereas the conventional P7 phosphur monitor usually requires 2 sweeps. For example, if a frame is stopped in the middle, the "top" of the new frame and the "bottom" of the old frame were equally illuminated and equally visible. Also, the last frame received would continue to be displayed on the fast scan monitor until the "erase" mode was energized. Incidentally, the system I have just described (load on the fly technique) was that of Robert WØLMD, who also lectured and distributed descriptive information on his unit. It may be a while before Robert's unit appears in print, as there are other operation expansions planned, and memory IC costs are still prohibitively high (his 65,000 bit memory exhausted *known* surplus sources) for most individuals. However, Robert does have circuit information, descriptions, scope patterns, etc., available for his cost of processing, $2.50. WA9UHV, has PC boards of the converter designed and built, but not completely tested. Availability is presently unknown, as other modifications may be added to the boards.

Another very interesting item, especially for those of you interested in APT weather satellite picture reception, was the converter unit Ralph WB8DQT, presented. This unit would permit either a scope or SSTV monitor to be used for direct readout of pictures. His unit is straightforward and relatively inexpensive and will probably come out in print very soon. If you really want to try something unusual, don't pass up the satellite idea. (Again, recent SSTV Scene articles had some information.)

Finally, for those of you building magnetically deflected monitors or FSS, I understand Brooks Radio and TV Corp., 487 Columbus Avenue, New York NY 10024, has a fairly large stock of 70° deflection yokes available for approximately $2 each, and descriptive information is usually included. Possibly this will turn into another good source of SSTV "goodies."

K4TWJ

SOCIAL EVENTS

TURKEY RUN

The 27th Annual Turkey Run Hamfest and VHF Picnic, sponsored by the Wabash Valley ARA, Inc., will be held Sunday, July 28, at Turkey Run State Park near Rockville, Indiana. Don't miss the Midwest's finest fleamarket. Fun for the whole family: XYL Bingo and fleamarket; food and refreshments, camping facilities, and park recreation for the kids. First Prize: Genave GTX-10, Second Prize: Regency HRT-2, Third Prize: Drake WV-4 VHF Wattmeter; plus many more. Activities begin at 9:00 AM with free coffee and doughnuts. Talk-in 146.94 by W9UUU/9. For details, send SASE to WVARA Hamfest, Box 81, Terre Haute IN 47808.

WARREN 17TH

The 17th Annual Warren Amateur Radio Association Hamfest will be held at the Yankee Lake Amusement Park in Yankee Lake OH, on Sunday, August 18, from 9:00AM-6:00PM EDST. For more information contact: R. Drew Kelley W8GFG, 822 Moore Street, Hubbard OH 44425. Phone: 216-534-3376. Bus. Ph. 216-448-6801, Ext. 393.

HAMILTON – HAMILTON

Q.T.H. – Holiday Inn, Hamilton, Ontario, Canada. Dates – October 25, 26, 27, 1974. There will be eight forums, extensive ladies program, fleamarket, banquet. Everything under one roof. For registration forms write: P.O. Box 836, Burlington, Ontario, Canada.

STRICTLY CINCY

This year the 37th Annual Cincinnati Hamfest will again be sponsored by the Greater Cincinnati Amateur Radio Association and will be held on Sunday, September 15, 1974, at the new Stricker's Grove located on State Route 128, two miles west of Ross (Venice), Ohio, north of Cincinnati. For more information contact: Greater Cincinnati Radio Association, 3965 Harmar Ct., Cincinnati OH.

MONTREAL '74

The 1974 Montreal Hamfest will be held August 4, at the MacDonald College Farm, Ste Anne de Bellevue. Prizes, Giant fleamarket, technical sessions, family fun, $2.50/adult. For more information contact: VE2RM, Box 201, Pointe Claire-Dorval, Quebec H9R 4N9.

OH! ADRIAN

The Adrian Amateur Radio Club will hold a Hamfest on October 13, 8:00AM – 3:00PM at the Lenawee County Fairgrounds in Adrian MI. Tickets $1 in advance, S1.50 at gate. Flea market, trunk sales, large display area – table $3 – half $1.50. Ample parking. prize drawing every hour. Grand prize drawing 3:00PM. Talk-in 146.46-.52-.94MHz For more information contact: Adrian Amateur Radio Club, Box 26, Adrian MI 49221.

ANGOLA FEST

The original FM hamfest Sunday August 4, 1974, near Angola, Indiana. Free flea market, entertainment for ladies and kids. Picnic grounds, campsites, boating, food, soft drinks, available, rain or shine. For information contact: Fort Wayne Repeater Assoc., Box 6022, Fort Wayne IN 46806.

20TH VHF

The 20th Annual VHF Conference will be held at Western Michigan University, Kalamazoo MI, on October 19, 1974. There will be Swap 'n Shop, Technical Forums, Evening Dinner, etc. For details please write: VHF Conference, S.M.A.R.S., P.O. Box 934, Battle Creek MI 49016.

GRAND EVENT

The Grand Rapids Swap and Shop will be held Saturday, September 21, 1974 at the Hudsonville Fairgrounds, M-21 at 40th Street, three blocks west of the Hudsonville traffic light. Admission is $1.75 at the gate, no charge for tables or trunk sales. Talk-in on .16/76 and 146.94. For more information contact: Grand Rapids Amateur Radio Association, Inc., P.O. Box 1333, Grand Rapids MI 49501.

LOUISVILLE BASH!

The 4th Annual Greater Louisville Hamfest will be held at the Oldham County Fairgrounds, LaGrange KY, on Sunday, August 25, 1974, from 8:00 AM until 6:00 PM. For more information contact: Denny Schnurr K4GOU, 1022 Sylvia St., Louisville KY 40217 or telephone 502-634-0619 (home); or 502-774-7549 (work) leave message.

THE L'ANSE CREUSE ARC

The L'anse Creuse Arc will open the fall season for swap 'n shops in the Detroit area on September 22, 1974, EDT 9:00 – 3:00 at L'Anse Creuse Central Jr. High School, main drawing 3:00, 3800 Reimold Rd., Mt. Clemens MI. Free parking, good food, prizes, tables $1.00. Admission $1.00. Talk-in on .94; For more information contact: L'anse Creuse Arc, 38024 N. Bonkay Dr., Mt. Clemens MI 48043.

MILWAUKEE FEST

(Bastille Day Celebration)

South Milwaukee Amateur Radio Club 4th annual Southeastern Wisconsin Swapfest will be held Saturday, July 14, 1974 at Shepard Park (American Legion Post 434), 9327 South Shepard Avenue, Oak Creek WI. Activities begin at 7:00AM and will run to 5:00PM or later. Parking, picnic area, hot and cold sandwiches and liquid refreshments will be available on the grounds. Admission is $1.00 and includes a "Happy Hour" with free beverages. Prizes will be awarded. Talk-in on 146.94MHz. More details available from: So. Wilwaukee Amateur Radio Club, S.F. Schreiter W9AKF, Secretary, 104 Brookdale Drive, South Milwaukee WI 53172.

INTERNATIONAL HAMFEST

The 11th Annual International Hamfest will be held July 13 and 14, at the Canadian Pavilion in the International Peace Garden between Dunseith ND, and Boissevain, Manitoba. Camping excellent. Party – Contest – Prizes – Meetings. For information contact: Ken Larson KØPVG, 807 Kelly Ave., Devils Lake, ND 58301, or Ron Samchuk VE4SR, 834-9th St., Brandon, Man.

"INDY" 14

(Another Bastille Day Bash)

The Greater Indianapolis Hamfest will be held on Sunday July 14, 1974 at the Marion County Fair grounds on the South East side of Indianapolis at the junction of Interstates 465 and 74. All events including the giant flea market will be under roof. Thirteen area amateur radio clubs combine to bring central Indiana an outstanding convention of technical forums, commercial displays and fellowship. Complete food facilities. Free coffee and donuts in the morning. Gates open at 6:00AM. $2.00 at the gate entitles the bearer to hourly and main prize drawings. There will be a presale ticket drawing for a Genave transceiver. The main prizes consist of an impressive array of low band and 2m Drake gear. There is a good restaurant on the grounds. Free prizes for the kiddies and a full schedule of women's activities.

UPPER PENINSULA HAMFEST

August 3 & 4, 1974, Negaunee Township Hall, Negaunee MI. Hiawatha Amateur Radio Association host. Registration $2. Swap n' Shop, Program for XYL's, Door prizes. Mobiles talk in on 3.920 and 146.94. Reservations and info: Frank K4CGQ/8, 322 Fortress, Sawyer AFB MI 49843. 906-346-5501.

MAPLE RIDGE

The Maple Ridge Amateur Radio Club is sponsoring a hamfest in honor of the Centennial of Maple Ridge, British Columbia, Canada, on July 13-14, at the Exhibition Grounds in Maple Ridge B.C. Registration S2, 12 and under free when accompanied by parents. D.D.C. providing Enforcement Van for frequency checks, and lecture on topical subjects; Swap & Shop, CW, Bingo, 2m Bunny Hunt on 147.33, Ladies program, Kids games, Prizes and more. Talkin on 3.755, 147.33, 146.76 and 34/94. Limited on site camping or trailering. For more information or advanced registration or assistance with accomodations write to Bob Haughton, President M.R.A.R.C., 20623 114 Ave., Maple Ridge, B.C.

WARREN HAMFEST

Largest family style hamfest in the east. Sunday, August 18th at Famous Yankee Lake Park. Giant Fleamarket, swimming, picnicing: all free. Details QSL W8VTD.

"INDY" 14

Greater Indianapolis Hamfest, Sunday, July 14, 1974, rain or shine, Marion County Fairgrounds, all activities under roof. $2 covers gate fee and prize drawing. For information write: Wm. J. Evans, 8104 Crest Hill Drive, Indianapolis IN 46256.

McKEESPORT SOCIAL

The Two Rivers Amateur Radio Club of McKeesport PA will hold its 10th annual Hamfest on Sunday, July 21, 1974, at the Green Valley Fire Department grounds off the East Pittsburgh-McKeesport Blvd., near U.S. 30. Check in on 29.000MHz. For information contact: Jim Hill WA3FSH, 2500 Banker Street, McKeesport PA 15132.

OKLAHOMA HAM HOLIDAY

The Oklahoma Ham Holiday will be held Saturday and Sunday, August 3 and 4 in Oklahoma City. In addition to the largest fleamarket in the Southwest the program will include special speakers, technical seminars, equipment displays, MARS meetings and unique activities for the XYL. Overnight parking for recreational vehicles is available. For more information and advance registration write Central Oklahoma Radio Amateurs, Inc., P.O. Box 15013, Oklahoma City OK 73115.

ZERO-BEATERS A.R.C. HAMFEST

August 4, 1974, Washington MO City Park. It starts at 10AM CDST, Auction at 11AM. Attendance prizes and other goodies. Auction, free bingo for XYL, cake walk, candy scramble – gigantic traders row. For Hamfest information and tickets write or contact Zero-Beaters ARC, Box 24, Dutzow MO 63342.

FT. WAYNE ORIGINAL

The original FM Hamfest sponsored by the Ft. Wayne Repeater Association WA9EAU, will be held Sunday, August 4, 1974 at the Steuben County 4H Fairgrounds off the Lake James Crooked Lake interchange of I-69 3 miles of Ind. Tool Rd. 80-90. Gate and flea market, open 0600-1600, free coffee & donuts 0600-0800. Admission S2.00 includes main prize drawing. Children under 12 – free. Talk in – 16/76–94/94.

NINTH SWAPFEST

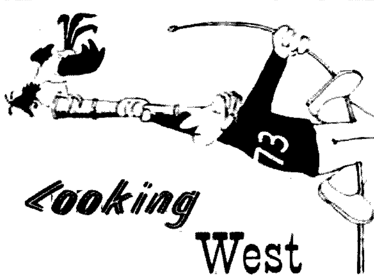
The ninth annual Northwest Texas Emergency Net Picnic & Swapfest will be held at the City Park in Levelland, Texas on Sunday, August 11, 1974. Bring your own picnic basket. Free registration begins at 0900. Lunch at 1300. Swapping all day. This event is for the entire family. Mobile talk in frequency is the net frequency 3950kHz and 28/88, 34/94 on 2m.

MELBOURNE HERE I COME

The 9th annual Melbourne Hamfest is September 7-8. All air conditioned, S1.50 at door. Tables $2/day. PCARS, P.O. Box 1004, Melbourne FL 32901.

GLACIER FEST

On the weekend of July 20 and 21, 1974 the WATERTON GLACIER INTERNATIONAL HAMFEST will be held in the beautiful Waterton Lakes National Park. For more information contact: John A. Fyke VE6AIV.



Looking West

Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA 91402

I believe it began: "Space, the final frontier." Memorable words from a memorable television program, "Star-Trek." I guess that I am what is known in SF (science fiction) circles as a "trekkie," one who tried never to miss an episode or rerun of that "series" that took one's mind into the future on voyages light years from home. I guess that I was not alone if the reports about ECLICON-'74 are what I hear. ECLICON is the yearly convention held in LA where devotees of the world of Star Trek gather much like our "HAMventions." We swap rigs and look at all the new goodies; they swap stories about what's what in the SF world and browse through the memorabilia of this now almost historic television series. I wanted to attend this year almost as much as I want a new HT220, but neither were possible. Thanks, though, to Pacifica radio station KPKF, a show thereon called "Hour 25" and its host Mr. Mike Hodel, I was there at least in spirit. Through Mike's eyes and voice, I was able to browse a bit while driving my mobile up the San Diego freeway; one of those times when the rig was turned off and the other FM radio was in use.

Well, Star Trek is gone except for the stations that still carry it in syndication. Perhaps it was killed off by the real thing; live television from space and from the moon. And, even more recently, those marvelous pictures sent back to old mother earth by NASA's Mariner Venus/Mercury probe. Amateur radio had its small part in the success of this mission; namely in those hams at the Jet Propulsion Laboratory here in Pasadina and at Boeing Aircraft in Renton WA who were part of the team of scientists, engineers and technicians working the project.

To celebrate the success of this mission, amateurs belonging to the Boeing Employees Amateur Radio Society and the Jet Propulsion Laboratory Radio Club offered a special QSL to any amateur worked by either WS6MVM or WS7MVM respectively. I was one of those lucky ones who worked Warren Andresen WA6JMM, under the WS6MVM callsign via the Mt. Lee Repeater, WR6ABN. So that we VHFers could partake of the festivities Warren supplied both the time and the 2m rig. In the process he handed out to we VHFers a considerable number of these "Special Event" QSLs; a job to which we here in LA thank him and the JPL club for their efforts.

Since we started discussing the media (i.e. television & radio) I would like to put my two cents in at this time about the February 7, "Chopper One." First, why wait till now? Simple, the first time around I did not see the program. I share something in common with that date in that February 7 is my birthday and though I had read the TV Guide blurb on the show, we had other plans for that evening. However, I knew if I waited long enough, ABC would run it again.

I was not to be disappointed. Last Thursday it was repeated and I sat glued in front of my TV watching the plot unfold. I have but one question for ABC and the producers of *Chopper One*. Why with as many hams working for ABC in LA was it not possible to ask one to act as technical advisor for the episode? Now if K6XEG were running a 450 MHz Base Radio, some of us might have believed that he had procured crystals for the Chopper's frequency and as Wayne put it "zapped onto the police radios." I've yet to see a dc Band station that can pull that trick. And that was a neat stunt hearing the bad guys on their CB walkie talkies halfway across town in a city where every 11m channel is 25 layers thick 24 hours a day. My advice to the media is use us, but don't abuse us. If you ask our help in producing something dealing with amateur radio many of us would consider it an honor to participate. But, for heavens sake don't make us out to be demented nitwits and foolish children. If one wants to figure numbers, that little fiasco probably cost ABC some 280,000 amateurs and God knows how many million CB operators as potential future audience. Let's face it, in the ratings game that's quite a hunk of viewership.

Therefore, I take it upon myself to make the following offer to ABC, NBC, CBS or any other LA station planning productions that involve amateur radio. If you need technical advice as to what will look right please contact me. If I cannot help you myself, I will do my best to put you in contact with an amateur; perhaps one working for your station or production company that can fulfill your needs. That particular *Chopper One* episode is a thing of the past and best forgotten by all concerned, but none of us want a repeat of this type of thing somewhere else next season. Well, one good thing, at least the "bad guys" were on the band where they belonged.

The "oops we goofed department" or to err is human to forgive devine. In May we mentioned a repeater in the Stocton area under the call WR6ACB. Well, that was a 3AM typographical error on my part. In a letter from Bill K6ZQ, I learned that my writing that column at that absurd hour had put WR6ACB about 400 miles north of where it belongs in La Habra Heights and on the wrong channel. WR6ACB is a Los Angeles area repeater on 19-79, owned by the Anaheim Amateur Radio Association of which Bill is president, and serves the Orange County area. With my buddy John WA2FMF/6, now a resident of Brea it might just pay to dig out my 19/79 rocks and put them back in the Sonar 3601 mobile. It's a good hour ride from here in the SF Valley to that area. I will give you the correct call for the Stocton machine next month. In the interum my apologies to both groups.

WA2HVK/6

CONTESTS

Tom DiBiase WB8KZD
708 6th Avenue
Steubenville OH 43952

Contest Calendar

July 27-29	CW County Hunter's Contest
Aug. 3-5	Kentucky QSO Party
Aug. 17-18	New Jersey QSO Party
Aug. 17-18	QRP ARC Contest
Sept. 14-16	Pennsylvania QSO Party
Sept. 14-16	Washington State QSO Party
Sept. 28-30	Delta QSO Party

This Month
CW County Hunter's Contest

From 0000Z July 27 to 0600Z July 29. Call CQ CH, exchange QSO number, category (portable or mobile, P or M), RST, State or province or country and county. Stations may be worked once per band and again if a county change was made. Scoring — QSOs with fixed stations are one point, with P or M stations — three points. Multiply points by U.S. counties worked. P&M stations calculate score on basis of total QSOs within a state. Frequencies 3575, 7055, 14070, 21070 and 28070. Appropriate awards. Logs must show category, date/time GMT (UTC), stations worked, exchanges, band, QSO points, location and claimed score. 100 or more QSOs require check sheet (of counties worked). SASE for results. Must be postmarked by September 1, and sent to CW County Hunters Net, c/o Jeffrey P. Bechner W9MSE, 64 North Pioneer Parkway, Fond du Lac WI 54935.

August
New Jersey QSO Party

From 1900Z August 17, to 0600Z August 18. Second period is from 1200 to 2300Z, August 18. Phone and CW are same contest. Stations may be worked once per band/mode. Frequencies — 1810, 3535, 3735, 3905, 7035, 7135, 7265, 14035, 14280, 21100, 21355, 28100, 28600, 50-50.5, 144-146. Exchange QSO number, RST and QTH (ARRL section or country). New Jersey stations send county. Multiply total QSO points by total different QTHs worked. New Jersey stations score one point for W-VE QSOs, three points per DX QSO. Non-New Jersey score one point per New Jersey QSO. (For New Jersey, the KP4, KH6, KL7, KZ5 count both as DX and ARRL sections (4 points). Appropriate awards. Logs should include GMT (UTC) date/time, band, mode, and must be received no later than September 14. The first QSO for each claimed multiplier must be numbered and check list of QSOs and multipliers should be attached. Multi-operating stations include all calls of participating operators. Comments welcome. Send to Englewood ARA, Inc., 303 Tenafly Road, Englewood NJ 07631. #10 SASE for results. Stations planning active participation in New Jersey are requested to advise EARA by August 3, so they can plan for full coverage from all counties. Portable/mobile operation encouraged.

WB8KZD

J.O.T.A. '74

The 17th Annual Jamboree-on-the-Air, will be held October 19-20. Suggested starting time is 0001 hours LOCAL TIME on Saturday, October 19, and terminating 48 hours later, i.e., at 2359 hours LOCAL TIME on Sunday, October 20. Note that these are only suggested times, if it is more convenient for your stations to operate on the Friday evening, then you are perfectly free to do so.

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you are interested, send *73* your name, address and phone number. Don't be bashful — remember, it's always easier when you have someone to give you that added bit of confidence.

73 would appreciate amateurs and clubs looking this list over and helping whoever they can. Do you remember when you needed help?

Aaron Jackson Jr.
P.O. Box 123
Clinton NC 28328

James D. Guy K7UAN
5818 S. 21st Dr.
Phoenix AZ 85040

Robert Bryan
P.O. Box 71
Cockeysville MD 21030
Telephone: 301-666-8453

Bishop L. Ellison
P. O. Box 631
West Branch IA 52358

NEW PRODUCTS

DYCOMM SUPER "D"*

Some months back, Dycomm ran a full page ad in several of the ham journals advertising a special "while they last" kit offer for their Super "D" amplifiers at an amazing low price of $49.95, which is less than the commercial price of the transistors supposedly used in the device alone. Apparently Dycomm had a goodly supply of these units stashed away, for the price was recently raised to $59.95 and they are still being offered. Dan WA1EYX, got one of these units, and I hoped for a chance to see it, and evaluate what appeared to be one of the better deals in a long time. The opportunity soon came, for shortly after completing the kit, Dan was having troubles in tuning it up, and we both set it up on the bench for a few measurements.

Technically, the amplifier is self-contained, requiring only 13.6 VDC and rf drive to operate. It is automatically switched into the line when it senses rf, and does not need an external keying line. Two transistors are used in a parallel arrangement. The transistors supplied were unmarked and manufactured by Dycomm. They were supposedly equivalent to the excellent Motorola 2N6084 types which are each rated at 40 watts out and have ballasted emitters for infinite VSWR protection. All parts, including a nice glass epoxy board were supplied with the kit. This unit has no low pass filter after the amplifier stage, an obvious shortcoming since with typical low-Q circuits used in the low-impedance high-current output network, harmonic content is probably no better than 25 dB down referenced to the carrier. This amp will be best used if installed in a fast mobile with an inconspicuous antenna.

Several other design shortcomings were evident. With more than 20 watts of drive, the ferrite beads used in the DC return chokes for the transistor base biasing saturated, overheated and smoked. The ordinary dipped silver-mica capacitors were originally used in series with the inductors feeding the extremely low input impedance of the transistors; these high rf currents caused dielectric heating of the capacitors, resulting in continual shift in tuning and eventual breakdown. The diode supplied to sense rf turned out to be a silicon power type and would not detect two meter rf energy; this had to be changed. The relay used for rf switching is an open frame type, and is apparently quite reactive at 146 MHz. Dycomm uses a series capacitor on the rf output circuit to tune out the reactance, but we were unable to obtain less than a 2 to 1 SWR between the exciter and amplifier. When operating straight through the amplifier, the relay is still in the circuit, and the capacitor must be re-tuned to obtain reasonable SWR.

Dycomm claims over 80 watts out with 30 watts drive, and 70 watts out with 20 watts in as being "typical" figures. Using two Bird 43 Wattmeters, our figures showed 50 watts out with 30 watts in. The heatsink used is minimal, and short transmissions must be the rule. We were unable to make further evaluations due to the failure of one of the output transistors, and sent the unit back to Dycomm along with their fifteen dollar "we'll fix it for ya" fee, and a letter describing the problems. It came back with better caps and new transistors, and was now putting out 60 watts with 30 in, still below advertised claims. After one week of mobile operation, it is again out of service with defective transistors.

We must give this amplifier an unfavorable report; this is regretable for it had the makings of a real good deal. Perhaps these design and manufacturing flaws were caused by component substitutions at Dycomm in order to meet demand, and if the problems are resolved we will report it in a future issue of INTERMOD. We understand several others have had experiences closely in line with ours with their *"*Super Dud*" also.

Reprinted from Intermod.

John K1ZJH

NEW CDR ROTOR

The new CDR Ham-II antenna rotating system has an important advantage over the older Ham M units in that the new control unit has a separate switch for operating the brake.

The inertia of larger antenna systems is a force that has to be considered. The sudden stopping of the brake action on the Ham-M units put severe stresses on the rotors, the towers, the tower guys, the antennas themselves. Something has to give eventually when repeated stresses like this are present. The new control unit permits the antenna to be turned and allowed to coast to a stop rather than slammed to a halt, whipping the tower and beam around.

The amateur net price of the complete Ham-II system is $150, with the control unit being available separately for about $80 – and it will work with any of the Ham-M rotors.

SAVE THAT RIG

The life expectancy of a good ham mobile rig left unattended in a car on the streets of New York is about 20 minutes. In Chicago it is about 40 minutes – and almost an hour in Boston, on the averagj. It is prudent to make every effort to protect your investment, not only with some sort of alarm system, but with the best locking device you can get – something that will keep the rig in the car even if a burglar manages to get into it – and they can manage.

Keeps-It Kit has a new bracket for your rig – a tamper-proof one. Normal tools such as screwdrivers, vise grips, allen wrenches, etc., are ineffective against the mighty grip of the Keeps-It. Models are available for the SBE, the Regency, and the Genave so far - with more to come. The price is only $16.

Before you take this lightly, call your insurance agent and see if you are insured against the loss of your mobile rig – and to what extent – and how about the second and third theft? Lordy, they even rip the rigs out in parking garages these days.

Details on Keeps-It Kit are available from *Jim Wallace K5SOY, Box 13249, Ft. Worth TX 76118.*

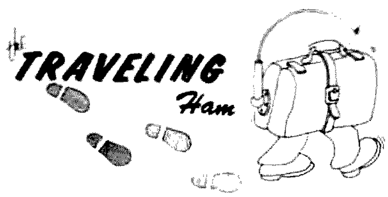
repeater update

Revision of Recently Published Repeater Atlas

AL	WR4AEJ	Birmingham		6.28-6.88
AL	W4MWF	Montgomery		DELETE
AL	WR4AGA	Mt. Cheaha		6.10-6.70
AL	WR4AGN	Opelika		6.34-6.94
			W1.8	52.780-52.525
	(Formerly: W4ZBA)			
AL	WR4AEH	Tuscaloosa		6.22-6.82
AZ	WR7ACK	Sierra Vista		6.16-6.76
	(Formerly: WA7KYT)			
AR	WR7ACT	Eagle River		6.10-6.70
				6.16-6.76
				449.2-444.2
AR	WR5AOI	Little Rock		6.34-6.94
	(Formerly: W5DI)			
CA	W6IWY	Canoga Park		7.66-7.86
CA	WR6AAA	Catalina Island		7.69-7.09
	(No PL)			
CA	WR6ACJ	Crestline		6.25-6.85
	(Erroneously listed as WR6ACI)			
CA	WA6LNU	Los Angeles (AM)		222.20-223.00
CA	WA6NTW	Los Angeles		222.34-223.94
CA	WR6ABI	Los Angeles PL		7.60-7.00
		(Hollywood Hills)		223.26-224.86
CA	W6NWG	Orange Co. (Mt. Palomar)		6.13-6.73
	(Erroneously listed as W6NOG)			
CA	WR6AOR/6	San Bruno Mt.		7.90-7.30
CA	WA6ILA	San Joaquin		DELETE
CA	WR6ACM	Vacaville		6.55-7.57
				52.760-52.525
				449.85-444.85
	(Formerly: WB6WYI)			
CO	WAØBAG	Colorado Springs		DELETE
CO	WAØVTV	Colorado Springs		6.16-6.76
CO	WAØNVU	Denver		444.90-449.90
CO	WØTX	Denver		444.35-449.35
	(Formerly: WAØVVC)			
CO	WRØABB			444.45-449.45
CT	WR1ACZ	Norwalk		7.99-7.39
CT	WR1ABC	Torrington		223.06-224.66
DE	WR3ABA	Wilmington		6.13-6.73
	(Formerly: WA3FRH)			
DE	WR3ACV	Wilmington		7.75-7.15
FL	WR4ACV	Boca Raton		6.22-6.82
				6.34-6.94
	(Formerly: WB4KVV)			
FL	W4LRH	Ft. Myers		6.28-6.88
FL	WR4AAF	Jacksonville		6.16-6.76
				52.760-52.640
	(Formerly: WB4QFL)			
FL	WR4AEG	Melbourne		413.8-448.8
FL	WB4KBG	Melbourne		6.25-6.85
FL	WR4API	Merritt Island		6.28-6.88
				6.34-6.88
	(Formerly: WB4KNQ)			
FL	W4MKO	Miami		CLOSED
FL	WR4AFO	Orlando		6.16-6.76
				6.34-6.76
	(Formerly: WB4QEL)			
FL	WR4AEQ	Orlando		6.58-7.18
				7.78-7.18
FL	WB4QER	Panama City		6.10-6.70
FL	WR4ADL	Pensacola		6.07-6.67
FL	WB4KNS	St. Petersburg		CLOSED
	(Formerly: WB4IES)			
FL	WB4AFJ	Tampa		CLOSED
GA	WR4ABJ	Athens		6.13-6.73
GA	WB4NST	Atlanta		DELETE
GA	WR4ABI	Atlanta PL 103.5		6.04-6.64
GA	WR4ADB	Atlanta		444.50-449.50
	(Formerly: WB4QGF)			
GA	WR4AEO	Atlanta		6.16-6.76
	(Formerly: WB4WST)			
GA	WR4AEW	Atlanta (Sandy Springs)		7.96-7.36
GA	WR4AFC	Atlanta		6.01-6.61
GA	WR4AFR	Atlanta		7.66-7.06
GA	WR4AGO	Augusta	T1.95	6.34-6.94
				7.90-7.30
	(Formerly: WB4KLM)			
GA	K4DVJ	Dallas		6.25-6.85
GA	WR4AEK	Gainesville (Walka Mt.)		6.07-6.37
GA	WB4CNC	Griffin		DELETE
GA	WR4AEA	Griffith		6.43-7.43
GA	W4RRW	Smyrna		DELETE
GA	WR4AEO	Stone Mt.		6.16-6.76
	(Formerly: W4BOC)			
HI	KH6EQF	Honolulu		6.26-6.88
				449.15-444.15
HI	KH6EDR	Lualualei		DELETE
HI	WR6ACL	Waikiki		6.16-6.76
	(Formerly: KH6FOX)			
HI	KH6NLH	Waipahu		DELETE
IL	WR9ACE	Aurora		CLOSED
	(Formerly: WA9EAW)			
IL	WR9ABY	Chicago		6.16-6.76
		PL		448.75-443.75
	(Formerly: WA9ORC)			
IL	WR9AOZ	Chicago PL		7.15-7.45
IL	WA9WJG	Danville		DELETE
IL	WR9AAA	Joliet		6.22-6.82
	(Formerly: WA9EAT)			
IL	WR9AAD	Murphysboro		6.25-6.85
IL		Springfield		6.28-6.88
IL	WA9WVB	Urbana	T2.25	6.34-6.76
IN	WA9EAU	Ft. Wayne		6.16-6.76
				6.31-6.91
IN	WR9ABN	Ft. Wayne		6.28-6.88
IN	WB9FHD	Freemont		DELETE
IN	WB9RAI	Indianapolis		DELETE
IN	WR9ACU	Indianapolis		6.28-6.88
IN	WR9ACZ	Lafayette		6.16-6.76
	(Formerly: W9EJV)			
IN	WR9ACX	Marion		6.19-6.79
IN	WR9ABO	Muncie		6.13-6.73
IN	WR9ABO	Pittsburg		DELETE
IN		Wabash Valley		6.25-6.85
KY	W4YWH	Covington		6.13-6.73
				6.19-6.79
KY	WR4AEM	Independence		7.86-7.26
KY	WB4RYX	Louisville		
LA	W5MCC	New Orleans	T1.8	6.16-6.76
				6.34-6.94
	(Formerly: W5UK)			
LA	WR5ADB	Raybille		6.16-6.76
	(Erroneously listed as Bayville)			
LA	WR5ACV	Shreveport		6.16-6.76
MD	W3EHT	Baltimore		DELETE
MA	WR1ACP	Agawam		6.40-7.00
	(Formerly: WA1HOS)			
MA	WR1ACB	Bellingham		7.66-7.06
MA	WR1ADF	Bridgewater		7.78-7.18
MA	W1ACM	Stoughton		6.775-6.175
MI	WA8BDD	Clarkston		6.25-6.85
MI		Detroit RTTY		6.22-6.82
MI	WR8ABN	Detroit		449.00-444.00
	(Formerly: WB8CRK)			
MI	WA8POD	Grand Rapids		DELETE
MI	WR8ACN	Grand Rapids	T2.25	6.18-6.76
	(Formerly: W8IIE)			
MI		Howell		7.63-7.63
MI	WB8CSU	Jackson		DELETE
MI	WB8COM	Lansing		6.22-6.82
				6.34-6.94
MI	WB8CRQ	Manistee		6.19-6.79
MI	WR8AAA	Milford		6.19-6.79
MI	WR8ACS	Rochester		
MI		Tawas		6.34-6.94
MI	W8FGB	Trenary		6.16-6.76
MS	WR5AOC	Gautier		6.28-6.88
	(Formerly: WA5RMS)			
MO	WRØABW	Kansas City		448.10-449.10
	(Formerly: KØOKI)			
MT	W7YB	Bozeman		5.28-6.88
NE	WRØACD	Beaver Crossing		6.16-6.76
	(Formerly: WAØVWO)			
NE	KØYRL	Lincoln		6.34-6.94
NJ	WR2ABJ	Cedar Grove		7.78-7.18
NJ	WR2ADV	Paramus PL 141.3		6.19-6.79
				443.1-448.1
	(Formerly: WA2UWR)			
NJ	K2GCL	Waldwick		DELETE
NM	WA5QLZ	Albuquerque		DELETE
NM	WR5ACX	Albuquerque		6.10-6.70
NM	WR5ABV	El Capitan		6.34-6.94
	(Formerly: WA5OMQ)			
NM	WR5ABU	Los Alamos		6.28-6.88
	(Formerly: W5POO)			
NM	WR5ACM	Mt. Taylor		6.34-6.94
	(Formerly: WA5JOZ)			
NM	WR5ACE	San Antonio Mt.		6.16-6.76
NM	WA5VKY	Sandia Crest		6.13-7.06
NY	WB2GDF	Brooklyn (CLOSED)		7.96-7.36
NY	WR2ABH	Dick's Hills (CLOSED)		7.90-7.30
		L.I.OXA		
NY	WR2ABL	Elmira		6.10-6.70
NY	W2AWG	Flushing		DELETE
NY	WR2ACK	Gloversville		6.10-6.70
NY	WR2AAA	Manhattan		7.73-6.73
NY	WR2ACV	Manhattan		7.43-6.43
	(Formerly: WA2ZWP)			
NY	WR2ACU	Rochester		6.07-6.67
NY	WR2AOG	Rochester		449.25-444.25
NY	WR2ABO	Rome		7.78-7.18
NY	WR2ADN	Saratoga		6.40-7.00
NC		Asheville		6.31-6.91
NC	WR4AGF	Asheville		6.22-6.82
	(Formerly: WA4NUO)			
NC		Burlington		6.07-6.67
NC	W4NBR	Goldsboro/Kingston		DELETE
NC	WR4AFV	High Point		6.19-6.79
OH	WR8ABT	Cheviot		DELETE
OH		Cincinnati		6.16-6.76
OH		Cincinnati RTTY		7.69-7.09
OH		Cincinnati		7.75-7.15
OH	WR8ABT	Cincinnati		6.07-6.37
	(Formerly: K8SCH)			
OH	WR8ACB	Cincinnati		6.115-6.70
	(Formerly: WB8NON)			
OH	WR8ACC	Cincinnati		7.99-7.39
OH		Cleveland		6.25-6.85
OH	WR8ABO	Cleveland		6.34-6.94
	(Formerly: K8MMM)			
OH	WB8CRP	Cleveland		6.22-6.82
	(Formerly: W8TTO)			
ON	WR8ACR	Cleveland		6.13-6.73
ON	WR8ABV	Columbus		8.16-6.76
	(Formerly: W8WTB)			
ON	WR8ACZ	Dayton		442.85-447.85
OH	WA8GEC	Fairfield		6.13-6.73
OH	WB8ABW	Galion		6.25-6.85
	(Formerly: K8ZES)			
OH	WR8ACW	Lima		6.34-6.94
OH	WR8ACO	Mansfield		6.34-6.94
OH	WR8ABM	Marietta		6.28-6.88
	(Formerly: W8HH)			
OH	K8PWL	Miamisburg		DELETE
OH	WR8ABS	Middletown		6.01-6.61
	(Formerly: WB8ATD)			
OH	WR8ABX	Newark		6.28-6.88
OH	WB8CQO	Toledo		DELETE
OH	WR8ACT	Toledo		6.19-6.79
				6.34-6.94
OH	WR8ADC	Toledo		6.01-6.61
	(Formerly: K8ALB)			
OH		Troy		DELETE
OH	WR8ACX	Warren		6.37-6.97
OH	W8IOO	Youngstown		DELETE
OK	WR5ADE	Oklahoma City		6.34-6.94
	(Formerly: WA5YTI)			
OK	WR5AOF	Oklahoma City		6.06-6.67
PA	WR3ABC	Allentown		6.34-6.94
	(Formerly: W3OI)			
PA	WR3ACO	Churchville		6.40-7.00
				222.98-224.58
PA	K3ZTP	Coatsville		DELETE
PA	WA3KXD	Erie		DELETE
PA	WR3ACO	Harrisburg		6.16-6.76
PA	WR3ACS	Johnstown		6.34-6.94
PA	WR3AAB	Lehigh Valley		6.10-6.70
	(Formerly: W3OK)			
PA	WA4BJS	Pittsburgh		6.16-6.76
PA	WA4BJS	Pittsburgh		DELETE
PA	WR3ACH	Pittsburgh		6.22-6.82
PA	W3OV	Philadelphia		7.63-7.03
				29.640-29.493

MORE NEXT MONTH

Send any and all corrections, updates or new listings to 73 Magazine, Peterborough NH 03458.



Joe Kasser G3ZCZ
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Silver Spring MD 20910

For a country at war, everything appears to be normal. There are one or two minor differences noticeable from peacetime, such as a lack of young men in the streets and no ham operation. The lack of ham operation does not seem to be by government decree, but because all the operators are away in the desert on active service.

The country that I am writing about is Israel, better known as 4X or 4Z. It is an ideal location for ham operation, since it lies right where Europe, Asia and Africa all come together. It is thus possible to work three continents and over sixty countries without any effort at all on the HF bands. The VHF bands also have extremely good propagation conditions particularly in the summer. Evidence of this is clearly demonstrated by the multitude of TV antennas sprouting from nearly every rooftop in sight. TV reception in Haifa and Tel Aviv is such that viewable pictures can be seen from Cyprus, Lebanon, Syria, Jordan and Egypt.

Most of the locals, hams or otherwise, speak some English and they are all very friendly. For those of you who would like to work into 4X without or before going there try listening on or around 21360 MHz after 1600Z. That is the time that I have been able to get through from Washington DC.

If you are like me when mobile with a TR-22 you will have to keep changing crystals when mobile in different parts of the country. I usually talk myself on frequency with the help of one of the locals using the copper bronze clip that holds the plastic cover in place to warp the frequency. WB4JFI who writes the ATV column has a neat modification for putting 12 channels in the TR-22. He uses a switch and strip of crystal sockets obtained from Lafayette CB rig spares. I'll write some more after I've put it in my rig.

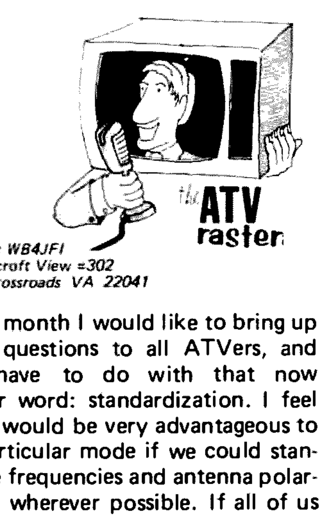
There seems to be more and more QRP rigs on the HF bands now. These rigs are ideal for the traveling ham. I worked a DX station the other day on 15, he was using an Argonaut transceiver and a 3 element beam. I worked a number of Europeans that day and his signal sounded just as good as the others. I even heard him in there calling through the others. QRP can do good things for the traveling ham.

If you are going to use QRP it is very important that you also use an efficient antenna such as a matched long wire or a dipole or a beam. Read some of the published material on QRP operation and see what the "pro's" use. You never know, you may end up using QRP at the home station. In fact while I am writing this I am also calling CQ on 80m RTTY using 8W output as indicated on my Heath HM-102 Power Meter. I haven't worked anyone yet but I'm hopeful.

Still for those of you who want to use big rigs, take care when you plug in the line cord, because the rest of the world does not necessary use 60Hz/110VAC lines. In fact more countries use 50 Hz/220V lines than 60/110V. I've found that a shaver transformer is an ideal device for interfacing my TR-22 to 220V lines for recharging.

Next month I'll present a list of line voltages and frequencies for the most commonly visited countries of the world. Until then keep those letters coming, for its only by such reader/writer feedback that I can determine if anyone actually reads this column.

G3ZCZ



Terry Fox WB4JFI
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This month I would like to bring up a few questions to all ATVers, and they have to do with that now familiar word: standardization. I feel that it would be very advantageous to our particular mode if we could standardize frequencies and antenna polarization wherever possible. If all of us were on the same frequencies with the same polarization, new hams wouldn't have to worry about what's in use in their particular area, and ATV DX would be feasible. Some people may not like this idea at first, but I know how frustrating it can be to look night after night after night for some ATV activity, only to lose interest simply because of too many variables. Having to move the antenna is bad enough, but when tuning a converter and worrying about polarization are thrown in, well, you need a lot more patience than most of us have. So let's get right down to the meat of the matter.

First of all there is antenna polarization. If we standardize on this and I hope we do, will it be vertical, horizontal or circular? I think that we can drop circular right away, because it's harder to build, not commercially available, and not in widespread use today. So now it's down to horizontal or vertical. Let's start by asking a few questions. Which, if either, has more gain under the same conditions? Which is cheaper and easier to build or buy? Does vertical or horizontal have the most overall advantages? I will have to admit right now that I am biased toward vertical polarization because of my own answers to the above questions.

As far as which works better under identical circumstances, rumor has it that above 300MHz neither out performs the other. I have heard of tests conducted by a branch of the military that showed this, but I haven't seen the results myself yet so I may be wrong. If anyone does have info on this I would appreciate it if they could send me a copy.

From which is easier to get gain? This turns out to be kind of a tricky question. If you're talking about directional gain, it's just as easy in either plane. Most antennas that are available will work both ways, you just have to rotate it 90 degrees if you're not right. The stickler is omnidirectional gain. The repeater is what really prompts this question, although omni-directional gain is also advantageous for roundtables, nets and mobile operation. Their are many, many vertically polarized antennas with gain on the market today, mostly because of the FM boom. Horizontal antennas are not only harder to make with gain and omni-directional coverage, they are also much harder to find commercially. That has also answered my question regarding price and availability. Another advantage is that commercial television runs horizontal polarization, so if we went vertical, the chances of TVI would be reduced. In case you're wondering why all the fuss about this, 450MHz isn't like 40 meters where often the difference in using cross-polarization isn't too noticeable. At UHF the difference can be as much as 20dB, or more. That is a lot to make up elsewhere.

I think that says what I feel about polarization, now I would like to hear from you, pro or con, because you are where it counts.

I'm sure this is a very touchy subject to some people, but as I mentioned earlier, it would help us and others getting interested in the long run, particularly if it is done now, before the 450 band gets as busy as 2 meters. Also, again I have my own feelings, which I'll bring up.

When we were first discussing putting up WR4AAG, we had a talk with our area frequency coordinator (he was set up as a mediator because of local 2 meter foul ups), and he told us that two frequencies had been sort of set aside all along the east coast for ATV. They are 439.25 and 427.25MHz. Since there wasn't any local ATV activity, we told him that we were going to try to put up a repeater on them. As it turns out, those are the best frequencies we could have gotten. Between 420 and about 425 MHz, there is some AM and CW activity, around 432 to 435 is some moonbounce and satellite work, and above 445 MHz is mostly FM, so we really lucked out, and got out of everyone's hair.

WB4JFI

NEW ENGLAND REPEATERS

—as of June 1, 1974

146.49	WR1AAF[1]	CT	Oxford
146.61	WR1AAH	MA	Marlboro
	WR1ABT	CT	New Haven
146.64	WR1ABV	MA	Waltham
	WR1ADK	CT	Hartford
146.665	WR1ABR	CT	Stamford
146.67	WR1AAI	MA	Boston
	WR1ABD	CT	Groton
146.70	WR1ACW	RI	Providence
	W1MTV	MA	Westfield
146.73	WA1KHC	MA	Mt. Lincoln
	WA1KGP	ME	Sanford
146.745	WR1ACR	MA	Somerville
146.76	WR1ACA	VT	Ascutney
	WR1ACE	RI	Lincoln
	WR1ADB	MA	Fall River
146.775	W1ACM	MA	Stoughton
146.79	WR1ACO	MA	Malden
	WR1ABI	MA	Fall River
	WR1ADJ	CT	Vernon
146.82	WR1ABA	CT	Simsbury
	WR1ABJ	MA	Weston
146.835	WR1ACO	CT	Monroe
146.85	WR1ABQ	NH	Derry
	WR1ADL	CT	Torrington
146.88	WR1AAC	MA	Salem
	WR1ABM	CT	Avon
	W1ABI	VT	Killington
	WR1ABG	MA	Webster
	WR1ACJ	RI	Providence
	WA1KGZ	ME	Buckfield
146.895	WR1ABE	CT	Bridgeport
146.91	K1FFK	MA	Greylock
	WR1AAA	MA	Malden
146.94	WR1ABU	NH	Concord
	WR1ABX	MA	Holyoke
	WR1ACI	ME	Bangor
	W1KOO	VT	Mansfield
	WR1ADD	RI	Providence
146.97	WR1ABF	NH	Salem
	WR1ABO	MA	Worcester
	WA1KGB	CT	Farmington
146.99	W1UD	MA	Boston
147.00	WR1ACP	MA	Agawam
	WR1ACQ	NH	Deerfield
147.03	W1QFD[2]	MA	Marlboro
	WA1KFZ[3]	MA	N, Adams
147.06	WR1ACB	MA	Bellingham
	WR1ACN	NH	Londonderry
147.075	WR1ACU	MA	Reading
147.09	WR1ABN	MA	Walpole
	WR1ACY[4]	CT	Glastonbury
147.12	WR1ABP	MA	Maynard
	WR1ADN	CT	Fairfield
147.15	WR1ABB	MA	Framingham
147.165	WR1ACL	NH	Salem
147.18	WR1ADF	MA	Bridgewater
	WR1ADM	CT	Naugatuck
147.21	DL2AA/WR1	MA	Medway
147.27	None		
147.30	WR1ACT	MA	Scituate
147.33	None		
147.36	WR1ACH	MA	Newton
	WR1AAD	CT	Canton
147.39	WR1ACC	MA	Oxford
	WR1ACZ	CT	Norwalk
147.42	WR1ADC[3]	MA	Somerset

1. 147.49 input
2. 147.87 input
3. 146.43 input
4. 145.47 input

All input frequencies are 600 kHz (0.6 MHz) below the output channels listed here from 147.03 to 147.39 MHz. I.E., you transmit on 146.01 MHz to use a repeater you can hear on 146.61 MHz.

FCC NEWS

Adopted: April 2, 1974
Released: April 4, 1974

1. Because of recently adopted changes in the Table of Frequency Allocations in Part 2 of the Commission's Rules certain variances exist between the information contained in the Table of Frequency Allocations in Part 2 and the Authorized Frequency list, Section 97.61, of the Amateur Radio Service Rules.

2. This Order is issued to conform the information in Part 97 with the information contained in Part 2 relating to frequency allocations.

3. Because this amendment relates to editorial revisions to effect consistency among the Commission's Rule parts, prior notice of rule making public procedure and effective date provisions are unnecessary, pursuant to the Administrative Procedure and Judicial Review provisions of 5 U.S.C. 553.

4. Accordingly, IT IS ORDERED, pursuant to Sections 4(i), 5(d) and 303 of the Communications Act of 1934, as amended and Section 0.231(d) of the Commission's Rules and Regulations, that effective April 16, 1974, Section 97.61 of the Commission's Rules is amended as set forth in the attached Appendix.

Frequency band	Emissions	Limitations
kHz		
1800-2000	A1, A3	1, 2
3500-4000	A1	
3500-3775	F1	
3775-3890	A5, F5	
3775-4000	A3, F3	4
7000-7300	A1	3, 4
7000-7150	F1	3, 4
7075-7100	A3, F3	11
7150-7225	A5, F5	3, 4
7150-7300	A3, F3	3, 4
14000-14350	A1	
14000-14200	F1	
14200-14275	A5, F5	
14200-14350	A3, F3	
MHz		
21.000-21.450	A1	
21.000-21.250	F1	
21.250-21.350	A5, F5	
21.250-21.450	A3, F3	
28.000-29.700	A1	
28.000-28.500	F1	
28.500-29.700	A3, F3, A5, F5	
50.0-54.0	A1	
50.1-54.0	A2, A3, A4, A5, F1, F3, F5	
51.0-54.0	A0	
144-148	A1	
144.1-148.0	A0, A2, A3, A4, A5, F0, F1, F2, F3, F5	
220-255	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5	5, 6
420-450	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5	5, 7
1215-1300	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5	5
2300-2450	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5, P	5, 8
3300-3500	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5, P	5, 12
5650-5925	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5, P	5, 9
GHZ		
10.000-10.500	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5	5
24.000-24.250	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5, P	5, 10
48.000-50.000	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5, P	
71.000-84.000	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5, P	
152.00-170.00	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5, P	
200.00-220.00	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5, P	
240.00-250.00	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5, P	
Above 275.00	A0, A1, A2, A3, A4, A5, F0, F1, F2, F3, F4, F5, P	

LETTERS

Dear Counsel:

In a recent column, you said tax rebels are "thoroughly convinced" that the federal income tax is unconstitutional. Is there any basis for this conviction?

Yes. Perhaps the strongest support is found in an article published in the December, 1972 issue of the American Bar Association Journal. It forcefully indicates that the present internal revenue code is so discriminatory as to violate the uniformity principles of the U.S. constitution.

I urge you to read this article. It was written by a top-rated lawyer, William G. Halby, formerly the tax partner in a very substantial law firm, now with Equitable Life in New York City. His analysis merits careful study by every American.

The 16th amendment to the constitution permitted congress to tax "incomes, from whatever source derived," without apportionment among the states. Still, any income tax law must be uniform, and must not deprive people of their property without due process.

The present federal income tax was enacted in 1913. In 1916, the U.S. Supreme Court held that it did not violate the uniformity and due process requirements of the constitution. But the present code bears little resemblance to the 1913 law, and judicial views have changed a lot in the last 58 years.

By implication, the Pennsylvania Supreme Court in 1971 said the present federal income tax is unconstitutional. The state had enacted an income tax law that adopted federal "taxalbe income" as its standard. Federal taxable income is the figure a taxpayer arrives at after taking exemptions, credits, deductions and other preferences to which he's entitiled. It's line 48 of the 1973 form 1040 return.

This Pennsylvania law was challenged quickly. In a 1971 decision, *Tilghman v. Kane,* the Pennsylvania Supreme Court held that it violated the uniformity clause of the Pennsylvania constitution. Why? Because it used "federal taxable income" as its standard.

The court found that Pennsylvania, by adopting this federal standard, created widespread tax preferences. Taxpayers with the same amounts of income were required to pay different amounts of taxes, depending on whether they were wage earners, investors, home owners, tenants, or something else. Result: "Unequal burdens" were imposed "in violation of the uniformity clause" of the Pennsylvania constitution.

So what? Does the Pennsylvania uniformity clause mean the same thing as the uniformity provision of the federal constitution? The Pennsylvania Supreme Court said "yes" in *Pennsylvania v. Girard Life Insurance Company,* a 1932 decision.

In this case, the court found that the Pennsylvania uniformity clause, as applied to tax matters, was parallel in meaning with the equal protection and due process clauses of the federal constitution. What would violate one generally would violate the other, the court said.

So, if the Pennsylvania Supreme Court were to pass on the federal income tax today, in all probability it would find the law unconstitutional. And if the question were squarely presented, the U.S. Supreme Court easily could reach the same conclusion.

Unfortunately, congress and treasury officials have muffed the Tilghman message, just as they have turned deaf ears to other solemn warnings of a coast-to-coast taxpayers' revolt. Time is running out. Let's shelve Watergate and get on with fundamental tax reform, before it's too late to head off impending disaster.

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WHY I HATE WAYNE GREEN

1. I suppose I hate Wayne Green mostly because he *thinks*. He thinks that a QSO should consist of more than just an exchange of signal reports, names, QTH's and type of equipment. He thinks that amateurs should do more than just try to see how many countries, counties, states, or whatever, they can work. He thinks that amateur radio is more than just a hobby, and that an amateur license imposes special responsibilities such as public service, making contributions to the advancement of the state-of-the-art, and spreading international goodwill.

2. I hate Wayne Green because he thinks that, even in these days of Watergate, there should be a sense of morality in our government. After all, what is so wrong for the FCC to take away 2MHz of the amateur 220 band just so the EIA can sell more radio equipment?

3. I hate Wayne Green because he refuses to be humbled by the dictates of the State. He thinks that since the government is supposed to be "of the people, for the people, and by the people," and since the IRS is a branch of that government, that "we the people" should be their bosses.

4. I hate Wayne Green because he is constantly needling the ARRL to become more activist. He should realize that due to the many League accomplishments over the past 50 years, the League should now be allowed to rest on its traditions and laurels.

5. I hate Wayne Green because he wants his readers to write his publication for him. He constantly asks in his columns for contributions of articles. He should realize that then any idiot could write an article for his publication. Too much readership participation is a dangerous thing!

6. I hate Wayne Green because of his interest in VHF. He thinks that just because the entire history of radio is one of moving to constantly higher frequencies, amateurs should follow that trend.

7. I hate Wayne Green because of his interests in other fields besides amateur radio. Kirlian photography, science fiction, and IRS troubles have nothing to do with my hobby! When I open an amateur publication, I want to shut out the world around me.

8. I hate Wayne Green because he sometimes disagrees with some of the regulations proposed and adopted by the FCC. He should realize that the FCC and its Amateur and Citizens Division always knows what is best for our hobby.

9. I hate Wayne Green because he is controversial. He should know that there is never any controversy in amateur radio. It should always be hushed up or committeed to death.

10. I hate Wayne Green because the prize for winning this crazy contest is a trip to the Bermuda Triangle! If you all don't mind, I'd prefer to travel to someplace a bit safer, like Vietnam, Cambodia, or the Middle East!

Phil Sager WB4FDT
3827 N. Abingdon
Arlington VA 22207

EDITORIALS HELP?

Wayne, I hope your editorials in 73 create enough activity by the taxpayers to force the IRS to change its policies.

Name Withheld
Toronto OH

SOLID STATE NEWS

In a recent editorial Wayne asked if there was anyone out there in Hamdon who would like to write a solid state column for us. The result: We were inundated with sample columns. Our minds were boggled and we couldn't reach a decision on which column to run. So we've decided to let you make the decision for us. Here are two columns. Next month we'll run more. Write and tell us which column you liked the best. We'll tally up the results and use the column that gets the best reader response.

Waller M. Scott K8DIZ

Through this new column we will try to keep you informed of new developments in the fast moving field of solid state electronics, with ham type applications in mind. As new products become available the ones of greatest interest to hams will be described along with suggested applications. We hope to give hints as to where the products can be obtained and for how much.

New ICs for receivers continue to pop up. Fairchild's μA720, primarily intended for AM car radios, can be put to many different uses at frequencies up to 30MHz. This device contains an rf stage, oscillator, mixer, i-f amp, AGC circuit and voltage regulator. The detector is not included in the IC so you are free to choose either a simple diode detector, product detector, or even add additional i-f or mixer circuits. RCA has introduced its CA3123 which is an identical IC. Sprague has their ULX-2137, National, the LM1820 and Motorola plans to announce an equivalent later this year. With all these sources, availability for the ham receiver-builder should be quite good. Mention should also be made of the RCA CA3088 receiver IC. It also is useful up to 30MHz and performs well as a receiver without an rf stage. The 3088 contains built-in i-f AGC and has an AGC amplifier for use with an outboard rf stage. An excellent choice for the rf would be a dual-gate FET using the 3088 AGC for gate No. 2. Additional features of the CA3088 include a built-in 30dB gain audio pre-amp and a drive circuit for an S-meter. The distributor prices of all these radio receiver ICs range from $2 to $3, but some of 73's advertisers may give you a better deal.

Quad op amps are very useful building blocks for an endless variety of circuits including audio, control, oscillators, voltage regulators, active filters, sweep generators, etc. Of course, all these can be built with single op amps too, but the convenience of having four amps on one chip makes circuit layouts smaller and more versatile. An added bonus is closely matched operating and temperature parameters since all of the op amps are processed under identical conditions. Texas Instruments' new SN72L044 is the first quad op amp designed for low power operation. When powered from a ±2V supply, it consumes only 340 microwatts! A natural for battery powered or portable equipment. All four amplifiers draw a total of 0.25 mA at ±15V supply voltage. This is idle current. Of course, your circuit design will determine how much load current will be added to the idle current. These low noise amplifiers are grouped into two sections so that power can be applied to only two of the op amps, if desired, further conserving power. Other features include internal frequency compensation, high slew rate, and output short circuit protection. For applications requiring only two low power op amps, TI also makes a dual device, the SN72L022. The quad is offered in a 16-pin DIP and the dual in both 8-pin DIP and metal packages.

If your interest is in ultra low power op amps, Siliconix has the L144 tripple. The three op amps draw only 150 microwatts (50 each) when operated from ±1.5V. This device features supply voltage to ±15V, internal compensation, programmable bias current, programmable power dissipation, single programming resistor and 80dB gain.

Single supply voltage op amp quads have been around for over a year. There have been some new additions, however. These devices have become unusually popular with the electronics industry, especially with the auto manufacturers. The performance, versatility and low cost make these ICs a must for anyone interested in experimenting with solid state circuits. The National LM3900 and new LM2900 have an open loop gain of 2800, unity gain BW of 2.5MHz, and operate over the voltage range of +4 to +35V. The Motorola MC3301 has a gain of 2000, BW of 4MHz, range of +4 to +28V. The Motorola MC3401 and new RCA CA3401 have a gain of 2000, BW of 5MHz, and a range of +5 to +18V. All these ICs have internal frequency compensation, require low input bias currents, and have output short circuit protection making them easy devices to use. Distributor prices for all these devices are just over $1, although some suppliers are selling them for 50¢. One of the best application notes ever written is available for the LM3900 from National Semiconductor (AN-72). It applies, in principle, to all the other types mentioned.

Timer circuits are finding their way into many ham designs these days: repeater timers, electronic keyers, delay circuits, and station ID timers to name a few. National Semiconductor has a couple of new precision timers, the LM3905 and LM322. Both of these timers operate over the wide range of +4.5 to +40V and maintain constant timing periods from milliseconds to hours. The LM322 provides excellent repeatability down to 3 microseconds. A minimum of outboard components are required. An RC network sets the timing, which is begun by the leading edge of an externally generated trigger signal. The timer output is a floating transistor with current limiting and can drive either ground or supply referred loads up to 40V at 50mA. You can program the output transistor to be either off or on during the timing period. The LM322 has two additional features not in the LM3905. One is the accurate short interval timing already mentioned. The other is an input to allow a 50:1 ratio adjustment in the timing cycle with a given RC by varying a voltage applied to that terminal. This feature allows use of the IC as a switching regulator, voltage comparator, or voltage to pulse rate converter. The low input current requirement allows use of a smaller timing capacitor for long time-outs, lessening the need for precision low leakage capacitors. These timers are available in several environmental temperature ranges. The LM322 is in a 14-pin DIP and the LM3905, an 8-pin DIP.

While talking of timers, we should mention the new Exar XR-2340CP programmable timer-counter. This IC is capable of producing ultra long time delays without sacrificing accuracy. Programmable time delays from microseconds to five days are available. Two ICs in cascade can generate time delays up to 3 years! Other applications of this IC include operation with an external clock, use as a frequency synthesizer (programmable), a staircase generator, 8-bit analog to digital converter, etc. The IC consists of an RC controlled time base, a binary counter (8-bit), and a control circuit. The basic time unit is set by choice of the RC network. The binary counter counts each output pulse from the time base. The desired time-out is selected by appropriate connections to the counter output pins. The timing cycle is programmed to be between 1T and 255T where T=RC. Accuracy of 0.5% and excellent temperature stability are claimed. In quantities of 1 – 24 the price is $4.50.

If you do not know of a local distributor who sells the devices mentioned, a letter to the appropriate manufacturer should get you a list of distributors and possibly data sheets and application info on the circuit of interest. 73 advertisers who specialize in solid state components can possibly supply you parts even though they are not currently advertised.

Addresses of manufacturers mentioned this month are: Fairchild Semiconductor, 464 Ellis Street, Mt. View CA 94043; RCA, Solid State Division, Box 3200, Somerville NJ 08876; Sprague Electric, Semiconductor Div., 115 N.E. Cutoff, Worcester MA 01606; Motorola Semiconductor, Box 20912, Phoenix AZ 85036; Texas Instruments, Box 5012, Dallas TX 75222; Siliconix, 2201 Laurelwood, Santa Clara CA 95054; National Semiconductors, 2900 Semiconductor Drive, Santa Clara CA 95051; Exar Integrated Systems, 750 Palomar, Sunnyvale CA 94086.

We would be pleased to hear from you as to what type of solid state developments you want to hear about in this column. K8DIZ

Vern Weiss II WA9VLK

I would like to invite you to become a part of this column. If you have a technical problem, jot it down and mail it to me. If you have a recent solid-state success in your life and you're busting at the seams to tell someone about it, write! Even if you have run across a newsy vacuum tube gadget, don't keep it from the masses. While the emphasis of this column is on the ham radio applications of solid state electronics, I have always felt that a well rounded ham shack is a hybrid ham shack. When pulling ourselves away from our own established prejudices we must admit that many electronic applications perform better with transistors while others simply lend themselves better to the good old valve parameters.

A LITTLE BLAH THEORY

If you are an average ham you probably feel that transistors are cute, nifty and wowee-Mama-watch-this. You also probably have a good knowledge of electron tube theory, but for now prefer to satisfy your solid state knowledge void by buying a Heathkit and worrying about theory later. Therefore, we are going to give you a shot of theory each month — in small doses - to ease the pain.

Tubes and transistors perform many of the same jobs, but in construction are entirely dissimilar. The first and most obvious difference is that they do not look alike. Tubes and transistors are made of different recipes. Nowadays, transistors are made of silicon-crystal or germanium metal materials. Most transistors presently used are of the silicon type. To complicate things even more, there is some experimentation taking place with semiconductor production involving the combination of the two elements, silicon and germanium. But for the most part, Germaine and Si have the market cornered.

Tubes as you will recall (get out the license manuals) are voltage-operated devices while transistors are current operated. Ah-Hah! You've got me there, right? I wince at the thought of you sitting there prepared to hit me with, "OK stupid, how do you explain the presence of current in tubes and voltage in transistors?" H-m-m-m. Let me think a minute. For now, let's just say that in a tube you can have the presence of voltage but not of current. Alternately, in a transistor, there can be current present but no voltage. Therefore, the tube must get its minimum daily requirement of volts if it is going to exist and live a happy life producing many, many happy little milliamps. In transistors the whole process is reversed. To further illustrate; how many times have you been trouble-shooting that final amplifier and was baffled because the 6146 had voltage but no plate current? This gets into specific conditions which will be dealt with later.

Often transistors, which thrive only because of the current within, are wrongly compared to tubes. The comparisons and "interchangeability" stem from nothing more than ever anxious marketing techniques and sales pitches and has little basis. The only parallel that should be drawn is that tubes and transistors can be harnessed to perform similar results in a circuit.

To dissect the "guts" we see that a tube (with its ohhh so warm glow on a cold New England night) grid controls the electron flow between the cathode and plate. Likewise, a transistor (with its cold, silent. . .almost standoffish personality) base controls the current flow between the emitter and collector. We also see that in a tube, the cathode shoots them thar little electrons off to the plate, which in turn, sucks 'em up. In the transistor, the emitter (so named because of its station in life) shoots the electrons over to the collector which catches them, like a solid-state Yogi Berra.

A mnemonic device to help remember these two component's inner-operations in relation to each other might be: Cathode — cathode; Grid — glow; Plate — proudly; Emitter — Emitter; Base — be; Collector — cool; . . .oh well.

THE DYNASCAN B&K 162 TRANSISTOR/FET TESTER

Those seeking an excellent transistor tester should seriously consider the B&K 162 TRANSISTOR/FET TESTER. The unit is accurate, fairly inexpensive, attractive and I consider it one of the better pieces of electronic test equipment available.

The unit displays a complete analysis of all bipolar transistors, field effect transistors, diodes, unijunctions, SCR's and triacs, whether tested in the circuit or out.

Since a transistor tester capable of monitoring every transistor component condition would be well beyond the financial grasp of many, the B&K does a nice job of diagnosing a component's state of being from a few universal tests which are sufficient to determine good-bad and current gain. A sequential switching procedure is involved in checking all solid state devices, therefore, no time consuming or confusing tester set up is required. With two rotatable switches (that 'click' so solidly) one can perform three leakage tests and a beta test. FETs may be tested with their own one-switch-to-test steps, measuring conductance (Gm), gate control and leakage. Even beginners would have no problem with operating the 162, and they probably would pick up a basic understanding of what solid state is all about. The instruction pamphlet is a storehouse of information in itself.

The B&K 162 has a METER! I mean. . .a *real* meter! It's a large, clear, easily read and highly responsive indicator and ohhh, what fine precision meter movement.

The only drawback is that the 162 is run on flashlight (D) batteries. This factor, coupled with its lightweight, makes it super-dooper for field service, but I have always preferred good 'ol 110 when it comes to test equipment. There's really no worry about inaccurate tests due to failing batteries as the B&K people built in a nifty battery test circuit, so I guess I have no real cause to gripe. Those with big fingers might do well to practice clamping the small test leads onto small component leads in small areas. It takes some diligent finger-gymnastics and a lotta hope to get the leads clipped onto the device under test in today's jam-packed circuit boards.

The B&K is a professional piece of gear through and through and any ham who has one is ready for serious solid state construction and repairs. The tester is one of those electronic devices you naturally want to put back into its box after each use. Cost is the same as 200 packs of cigarettes. . .and well worth every pack.

It looks as though space is running out, but again I want to emphasize that I would like to hear about those projects of yours. . .and problems. The idea of awarding a handsome award each month for THE homebrew project has been proposed, so get out the junk box and set out to dazzle and amaze us. Next month I have a handy little transistor aircraft band receiver for those of you frequently in the "hanger-flying" situation, desiring something on VHF that works from the innards of a Band-Aid box.

See you on the circuit!

WA9VLK

Edwin Hartz K8VIR
P.O. Box 127
Holly MI 48442

4-1000A GROUNDED GRID LINEAR

Featuring:

Solid state alc
Shielded module construction
Plate vacuum tuning
80 through 10 meters
Thyrector protection
4-1000 technical summary

Simplified module construction incorporated with up-to-date features including high plate dissipation make this linear amplifier an excellent choice for reliable contest, rag chewing or SSTV applications.

Construction

The following tools were used in the construction of the amplifier: metal munching tool, pop rivet gun, electric drill, various hand tools and a good soldering gun.

The main chassis 43.18 x 43.18 x 10.16cm (standard) and the front and back of the amplifier is constructed from 43.18 x 43.18 x 7.62cm (standard) and 33.02 x 17.78 x 7.62cm (standard) chassis respectively. The front and back are mounted to the main chassis by pop rivets around the perimeter. The cover is manufactured by hand bending a 48.26 x 121.92 x .16cm (standard) sheet of aluminum to tightly fit chassis assembly and is held in place by sheet metal screws at 3cm intervals.

Bending can be accomplished with two pieces of angle iron. The material to be bent is clamped between the angle irons using C-clamps and a vise. Use a piece of flat wood as a protector between the hammer and the material to be bent to avoid unsightly hammer marks. A commercial metal bending brake will no doubt do a better job in far less time provided you have or can borrow one.

The air is exhausted by mounting home air vent assemblies on the sides of the cover and perforated aluminum sheeting over holes on the top and back. A total of six holes are covered by the perforated aluminum.

To achieve proper shielding, the screen in the air vent is removed and replaced with perforated aluminum eave trough screen, available at most hardware stores. When properly installed it provides excellent shielding but it is too weak to be installed without a frame. Attach the air vents a minimum of every 2 cm around the perimeter of your cover to provide adequate shielding. Small aluminum pop rivets really come in handy here but make sure each rivet is fitted tightly. Before I attached aluminum to aluminum I roughed each contact surface with extra fine sand paper to assure a good electrical connection. Also, each chassis was electrically connected together by lengths of copper braid.

The front of the amplifier contains a relative output meter (lower left), plate current meter (upper right) and grid current meter (upper left). The high voltage reading

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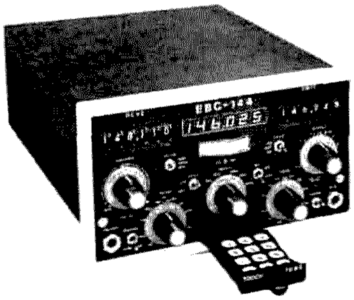

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was taken from a voltmeter mounted directly in the power supply.

The three controls on the front in the lower left are cathode tuning, relative output level and alc level. Also included is a turns counter in the upper right for the vacuum variable capacitor and a vernier dial for the loading capacitor. The band switch is located in the middle and ganged to the cathode circuit via two right angle drives, providing single switch band switching. Once drives were properly adjusted I soldered them to the shaft to prevent slipping.

The bottom plate is made from .32cm (standard) aluminum or steel with one caster at each corner. It should be held in place by sheet metal screws placed a distance of 3 cm to insure adequate shielding.

To provide safety and stability, many sub-chassis are used. The alc and relative output circuit are shielded in the final enclosure. The sub-chassis are relatively inexpensive if purchased, but could also be hand formed.

The alc and relative output circuits are enclosed in aluminum miniboxes. The plate and grid current meters are enclosed in a 12.7 x 25.4 x 7.62cm (standard) chassis with steel or aluminum bottom plate attached. The relative output meter was a shielded meter and provided low measured leakage with no enclosure. The loading capacitor has an added frame enclosure but it is not critical in the design. The rear of the amplifier is designed with safety in mind. The B+ and B– connections are in a 12.7 x 10.16 x 7.62cm (standard) chassis with two grometted holes in the bottom. High voltage cables should have a minimum rating of two to three times the voltage expected to be encountered. The blower is fused and the blower solder connections and fuses are located in a small minibox. The ac line is terminated in a small sub-chassis and at this point the thyrector attenuates line transits providing protection to your solid state devices. The ac is fed into the bottom chassis through two feedthrough capacitors and is fused in the plug with two fuses, one on each side of the line. This places all but one fuse externally and readily available. Located on the back are three shielded banana outlets for vox, alc and the high voltage

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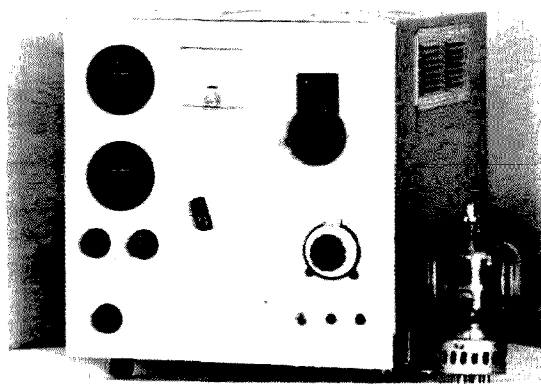

Front view. Meter upper left grid drive, lower left relative output, center plate current. Three controls in lower left. Alc far left, relative output sensitivity right, cathode tuning lower left. Front center control band switch. Upper right turns counter. Lower right loading control. Switch, on and off. Green filament light left. Red high voltage light right. Note: air vents on side.

light. Located below the banana plugs is a heavy-duty ground connector *which should be utilized to recude possibilities of electrical shock.* The rf is fed directly into the lower compartment and output is taken directly from the upper chassis to eliminate the problem of feedback. Shielding between input and output circuits of a grounded grid amplifier reduces the possibility of parasitic oscillations. The large opening in the rear of the amplifier where air enters the pressurized bottom chassis from the blower must be adequately shielded. An aluminum screen mounted over the hole and bolted in place at a minimum of every 2 cm insures good electrical connection between the screen and chassis. Be sure to clean the screen occasionally as it will clog up with dust, decreasing air volume. Place the blower a good distance away from the tube socket and seal any undesirable air leakage points in the bottom chassis with silicone rubber sealer to provide a good pressurized system. Cutting the lower flange off the tube socket will also provide better unrestricted air flow if you use the standard SK-510 socket.

To protect the operator, metal shafts that protruded out the front were equipped with insulated shaft couplings. All shafts at ground potential were connected directly to ground via flexible copper cable. This was done as double protection even when the shafts were already at ground potential, as in the case of the loading capacitor. I took great care in these connections to guarantee they were electrically and mechanically strong.

Wiring

The wiring of the amplifier is straightforward. If you are contemplating construction and have not built a linear before, I would recommend the reading of construction techniques, as applied to rf amplifiers, in the handbooks – particularly the section on preventing radiation from the transmitter.

The input circuit is a tuned cathode circuit. The 4-1000 requires a substantial amount of drive; therefore a cathode tuned circuit is a must. This reduces drive requirements and also provides improved distortion products. When constructing this circuit, keep in mind that 10 meters may be a problem in respect to drive – therefore align coil and capacitor combination to provide short connecting leads on ten. Silver plating the cathode coil and leads also provides measurable improvement on ten. I had no problem with drive, but if your exciter is marginal it could make the difference.

Grid drive is monitored with a 0-1 mA meter utilized as a millivolt meter. *Be sure to calibrate meter before soldering the screen.* As the screen is operated in parallel with the control grid it must be disconnected from ground so that you are reading control grid current only. To calibrate the meter you must determine the proper value of the series resistor Rx. This is found by placing a regular milliammeter with a scale of 200 mA or more from the vox terminal to ground. Carefully apply excitation with no plate voltage and substitute resistors at Rx until both meters have the same deflection at 100 mA. My meter required 82Ω but this is variable depending on meter characteristics. Another meter may require a larger or smaller value. As the 4-1000 has no plate voltage at this time, the control grid dissipation can be easily exceeded. Therefore be extremely careful and work quickly during periods of excitation.

The plate current is measured by the meter being shunted across a 10Ω resistor in the negative high voltage lead. The resistor

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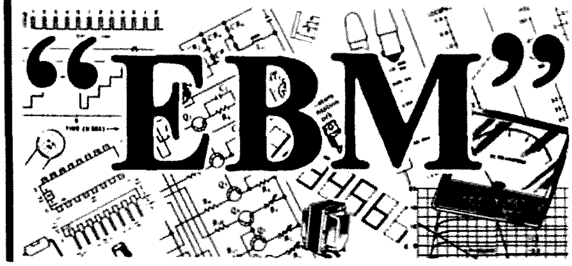

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Just by way of example, the section on hand soldering was boiled-down from the practices of the American Welding Society -- Committee on Soldering and Brazing; NASA, USN, solder manufacturers, the Bell Telephone System and others. The section contains everything you need to know about solder, fluxes, soldering tools and techniques.

There are over 100,000 words covering theory and application of semiconductor devices -- diodes, transistors, the SCR/TRIAC, digital and linear integrated circuits, operational amplifiers, voltage regulators, counters and decoders, and much, much more.

Sections also treat the vacuum tube and CRT, capacitors and electrostatic devices, relays and switches, electromechanical devices and mechanical movements, energy sources, cable and wire, ++++++

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was placed at the power supply and the negative terminal of the supply must not be grounded except through the resistor.

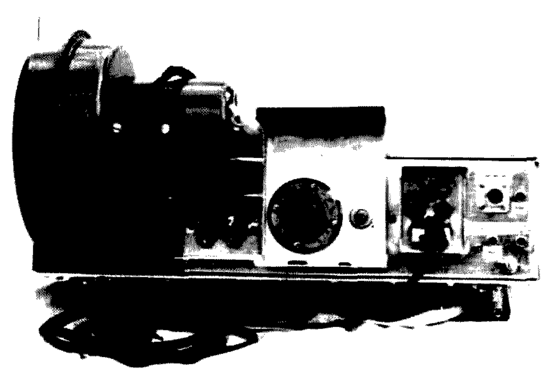
The screens are connected to ground via a .64cm flexible copper ground strap which passes through the slot of the socket directly from ground to the screen pin. Both pins are grounded in the same manner. Keep leads short! All power and metering leads were shielded and bypassed according to good construction procedures.

The entire plate circuitry was silver plated and the connecting output lead from the coil assembly was of silver plated .65 cm (standard) copper tubing. The plate and vacuum capacitor lead are made from silver plated flexible 1.27cm copper ground strap.

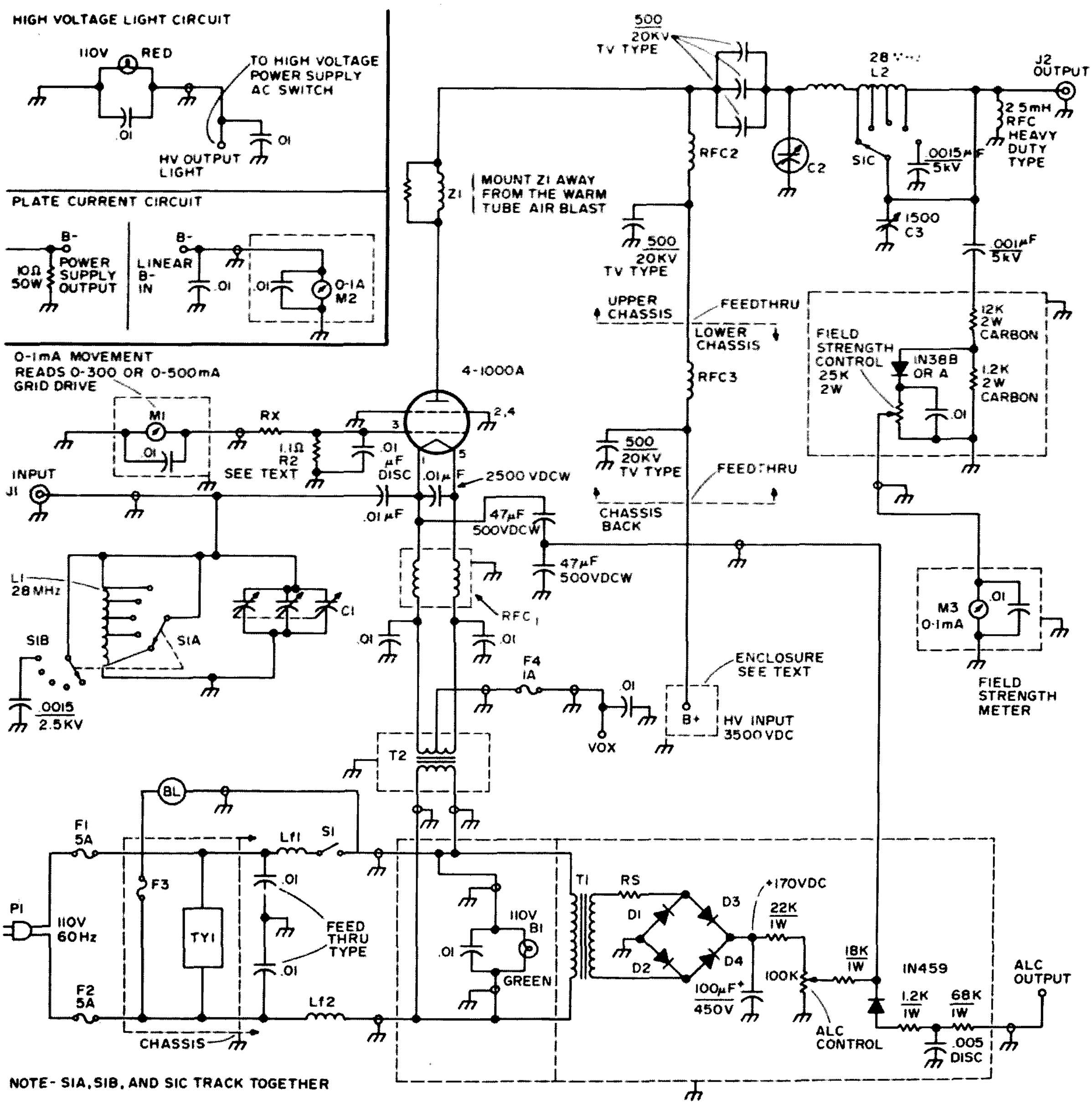
Silver plating was accomplished with a small electroplating unit powered by flashlight batteries. It was simple and required no special skill. There are different units available from various electronic outlets with prices starting at a few dollars.

Adjustment

Before applying any potentials recheck all wiring. Set the sensitivity of the output indicator to minimum, that is, maximum resistance with the slider of the 25K pot at ground. Connect a dummy load of 52 to 72Ω. Select the proper band with S1 and apply plate voltage. Apply a small amount of excitation. Peak up C1 for maximum reading. Resonate the output circuit with C3, making sure the loading capacitor is set at full capacity. Adjust C3 and C2 to increase



Right to left: Rear view showing ground, alc, H.V. indicator, vox terminals, rf input terminal, ac input showing feed-through capacitor, thyrector and enclosure. Middle enclosure B– and B+ terminals. Left enclosure blower ac supply and fuse. Far left blower.



Schematic diagram of the modern 4-1000A, Class B, grounded grid, linear amplifier.

the plate current to the input power level you desire while increasing drive to 120 to 150 mA. You will probably note that the rf output meter and plate current meter conflict somewhat. Maximum output does not always occur at the point of resonance. Don't let this alarm you, adjust your drive and loading to a point where for a given drive, the output drops off slightly at your desired input. This is the point where you will generally achieve the best linearity. Once you have established your tuning for a band, record turns and loading for future reference.

To utilize the alc properly, connect the exciter to the linear via the alc connector on the rear of the amplifier. Once connected you may adjust your alc to achieve the maximum limitations you desire. The alc section, if properly utilized, can increase the average power output while maintaining the linear within the amateur power-input limit, providing that extra punch to communicate under adverse conditions.

Operation

The operation of the amplifier has been excellent. It provides adequate efficiency

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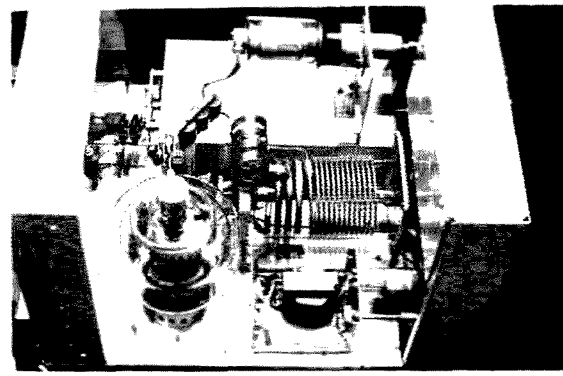


Looking down on amplifier's alc enclosure cover removed for photo. Note: also vacuum variable mount. Relative field strength enclosure and 2.5 mH rfc is located in upper left.

and it is built with long-term reliability in mind. The multi-band linear circuit compared most favorably with a single band configuration on 80 meters which would be expected. Comparison of harmonic levels with commercial ham linears provided data that equalled or exceeded the commercial designs tested. In respect to tube operation, the 4-1000 will loaf at the 1 kW dc level, whereas some commercial circuits are operating the finals at or beyond maximum level which could lead to unpredictable reliability. The 4-1000 can be damaged, however. The control dissipation is limited to 25 watts – therefore keep an eye on the grid drive. Do not exceed 200 mA drive, and *never* apply full excitation without any plate voltage.

Technical Summary 4-1000A

TVI

The 4-1000 proved not to be guilty of rampant TVI. The circuit described was compared with commercial amplifiers at the same power level, 1 kW, dc, and it provided equal or better results. Circuits designed, constructed and operated according to good engineering practice should provide excellent results. Persons experiencing severe TVI problems with the 4-1000 should review their design and operating parameters for possible errors. This is not to discount problems due to rectification or overload. However, these problems are not the fault of the linear.

Drive requirements

The 4-1000 does require a fair amount of drive. Most commercial exciters should drive

the amplifier to 1 kW dc up to 15 meters, however.

Ten meter drive requirements may be a problem for two basic reasons: (1) Some exicters fair poorly when it comes to output on 10. They provide substantially less output on 10 as compared with 15 meters. A check of your exciter's output efficiency would be advised before selection of this tube for 10 meters. (2) When building the multi-band input cathode circuit, much energy can be lost in this configuration. Normally the majority of loss is at the highest frequency of operation.

Parasitic oscillations

If the 4-1000 circuit is wired according to good engineering practice with proper preventive measures taken, you should have no unusual problem with parasitics. Before you place your amplifier on the air, you should completely check it for parasitics on all bands. When first constructed, a parasitic may well occur but once the amplifier has been stabilized, it should provide excellent results. Parasitics are generally the result of the layout and wiring and not the tube per se. Keep in mind that it is indeed a lucky ham who builds a linear with any type tube who has a completely stable amplifier to begin with.

Negative aspects

Tube cost is considerable. Although I used new tubes in my circuits, used or pull-out tubes have in some cases been used to advantage. But beware, a pull-out tube may have very low emission, causing a change in plate load impedance requiring changes in loading parameters for maximum efficiency.

The air flow required causes irritating noise. Even if a low noise blower is used, air whistles as it flows through the perforated holes in the shielding. If you are using a great amount of audio processing the noise level may be prohibitive.

The tube is large physically, which requires a large enclosure.

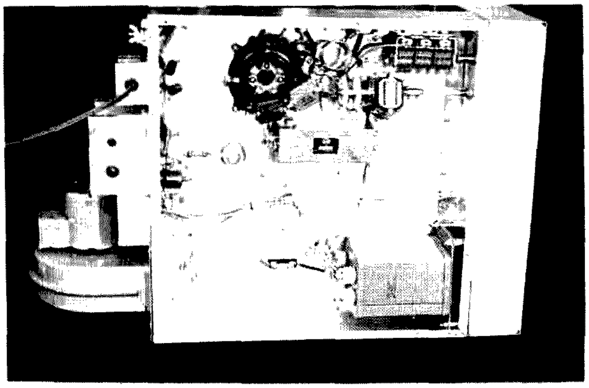
Component Modifications

To prevent the possibility of high voltage breakdown due to moisture at the base of the B&W 800 a fiber screw replaced the metal one supplied. Also, the B&W 800 was not mounted directly on the chassis. A 2.54 x 5.08 x .32cm (standard) piece of plexiglass was cut and the choke was mounted to it. The plexiglass was mounted 1.27cm above the chassis on two 1.27cm insulated standoffs.

An extra switch position is required for the B&W 850A so that the .0015 μF mica capacitor can be switched in on 80 meters. An extra contact for constructing the switch is available from Barker & Williamson in Bristol, Pennsylvania.

A note on the B&W 850A

The B&W 850A multi-band inductance does an adequate job of impedance transformation considering it covers 80 through 10 meters. It does not, however, provide the



Bottom wiring view.

optimum results that a well-designed single band linear can provide.

In essence, if you are a band hopper and prefer convenience, the B&W 850A will fill the bill. But if you are basically a one-band man, critical about efficiency, you would probably be happier omitting the B&W 850A, saving a few bucks and going single band by replacing L2 with a single band inductance. For further details see pi-network design in the various handbooks and journals.

Credits

I would like to thank the countless amateurs who generously gave their time and advice, which helped in the design, construction and testing of this circuit.

. . .K8VIR

Kent A. Mitchell W3WTO
1004 Mulberry Avenue
Hagerstown MD 21740

FREE TT BATTERIES

By now, most everyone is aware of the new Polaroid SX-70 color camera. If you don't have one yet, you probably have a friend that does, and in any event you consequently know that the camera system contains sophisticated IC circuits (containing more than 200 transistors) which provide automatic exposure settings, an electronic shutter, flashbulb sequencing and firing circuits, and a special high speed motor to expel the exposed photograph from the camera

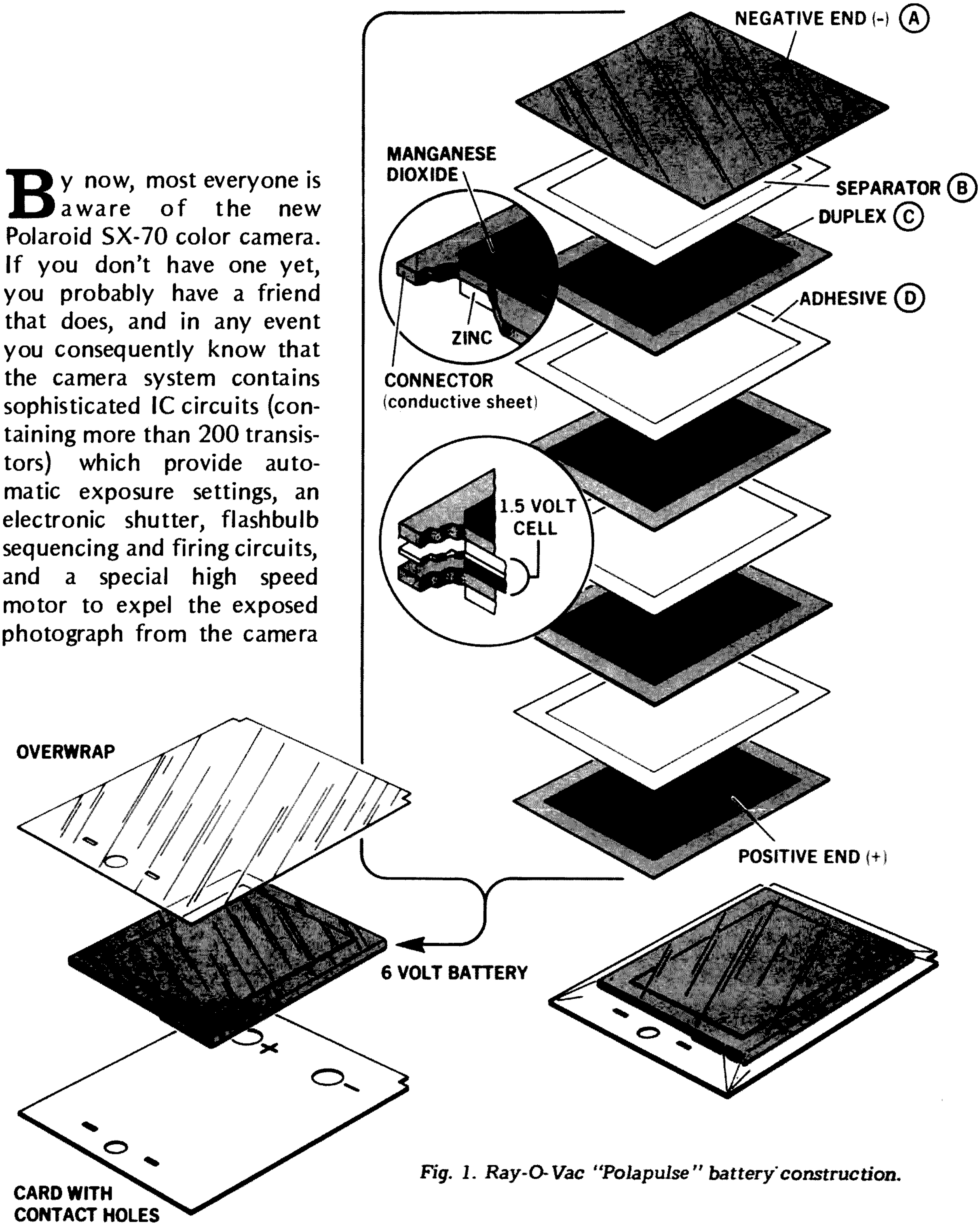


Fig. 1. Ray-O-Vac "Polapulse" battery construction.

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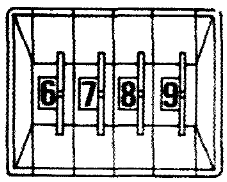

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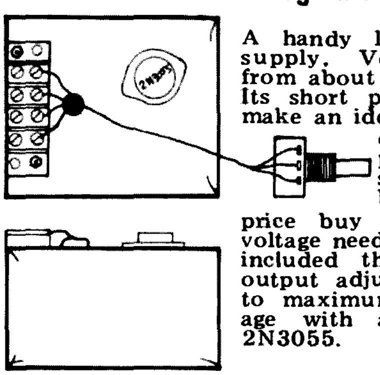

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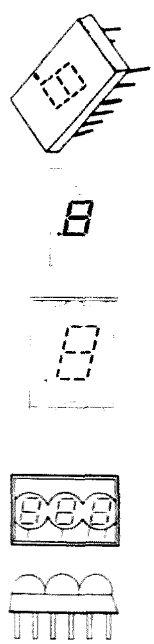

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body. To insure adequate power to perform all of these functions, the Polaroid people took no chances and built an internal battery into each film pack. This means that after only a few seconds use an almost new power source is disposed of! This is more than my frugal "don't throw it away. . .it may be good for something" glands could tolerate, as a glance at my junk box will prove.

After collecting several of these discarded film packs my curiosity was satisfied by dissecting the plastic holder and removing the battery. . . whereupon I discovered that it was manufactured by RAY-O-VAC and is known as their model P-70. A note to their Technical Sales and Service Section brought quick response and the following information.

The P-70 battery is a new concept in battery packaging. Four 1.5 V zinc carbon cells in a 3.2 mm thin laminated stack

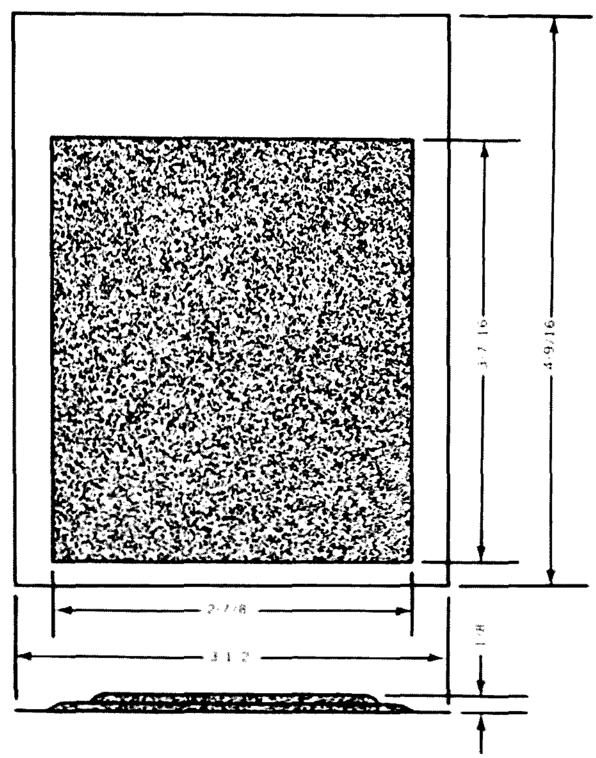

Fig. 2. P-70 dimensions.

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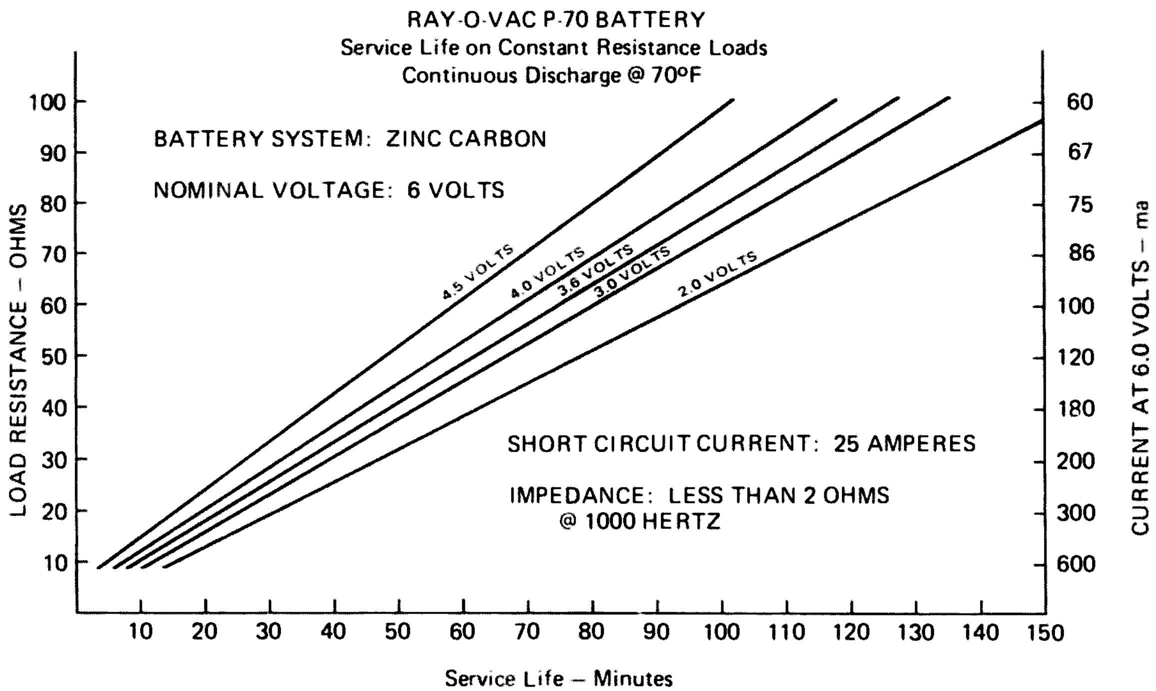


Fig. 3. New battery performance.

produce a 6V battery that is protected by steel and mounted on a card for easy handling. This type of construction provides a large electrode surface area capable of producing high current with a small battery volume. Each individual cell is composed of a top sheet (A) of steel coated with zinc on its underside, a separator (B) and a conductive sheet (C) coated on the top side with manganese dioxide and coated on the bottom with zinc, see Fig. 1. The individual cells are electrically connected by the conductive sheet. When the cells are stacked, an adhesive perimeter (D) on each separator fastens the cells together. The steel top sheet wraps around to the bottom of the stack to permit the minus and positive terminals to be on at the same side. The pack is mounted on a cardboard sheet, insulated and sealed with a clear plastic film overwrap. The overall dimensions are shown in Fig. 2.

What we have to work with is a small, thin, flexible battery capable of producing high current rates for short durations. An application for these batteries which immediately comes to mind is power for touch tone pads. Most pads are designed to operate from 9 to 15V, so two of the P-70 batteries in series would do the trick. A standard Western Electric pad draws about 12 mA when producing a tone. The power output capabilities for a new battery are shown in Fig. 3. I ran a series of tests with a used pack under a continuous 200 ohm resistive load, while monitoring current and voltage, and observed a nominal 5.8V at 26 mA for several hours. Then the voltage rapidly fell off to about 2V. Some rejuvenation was observed after an overnight rest but the voltage gradually and steadily dropped under load to the point of uselessness. However, with the intermittent type of operation we will be subjecting the battery to it should hold up for weeks.

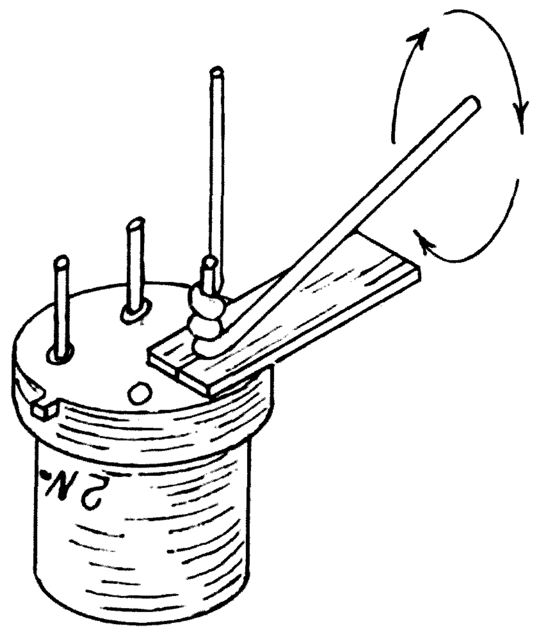
Stacking several of these battery packages can produce many combinations of desired output voltages and current capabilities to power experimental ICs or other solid state devices where current requirements are only a few mils, or for higher current-short duration applications, such as the aforementioned TT pad.

Well, happy picture taking. . .and save those film packs!

... W3WTO

Silas S. Smith WA9VFG
2308 McCord
Murphysboro IL 62966

THE SCOTCH TRANSISTOR



Don't throw away those transistors on printed circuit boards. They can be salvaged at a very low cost. A good transistor can be had for less than a nickel by the method described here.

Some circuit boards are so thin and the leads cut so short, that the removed transistors are nearly useless. I have tried soldering leads to these transistors many ways without too much success. The leads either short to the case after mounting, or come loose when being soldered to the other components.

The method that I have found best is to take a small piece of cardboard and cut it down the middle for about 1/8 or 3/16 of an inch. This cardboard is then slipped onto the transistor lead. This cardboard will, in most instances, block solder from running down the lead into the transistor case. It will also space the new lead from the transistor. The new lead is a piece of 24 gauge tinned wire. The transistor is held upside down in a vise. The cardboard is added to one lead at a time. The tinned wire is started at the bottom of the transistor lead at the surface of the cardboard. A leader of approximately 2 inches is left on to aid in the wrapping of the tinned wire around the old transistor lead. I have found most transistor leads are long enough to get at least 2 full turns of wire around the lead. Now is the time to solder the transistor lead and the new lead together. Fasten a heat sink to the two inch leader. After the solder has cooled, hold the new lead taut, and twist the 2 inch leader off, using an upward pull. Remove cardboard and repeat for all leads. Inspect work, then cut all leads the same length. To mark the emitter lead, cut it 1/4 inch shorter. After the leads are dressed up, they are ready for potting.

A mini-cube plastic ice tray is used as the mold. The transistors are carefully placed into the ice tray. The epoxy is mixed and poured in. After setting, the new transistors are removed. The new leads can now be handled in the same way as leads on a new transistor. They will now be insulated from the transistor case, and will not affect the old leads, as they are held rigid by the epoxy. The little cubes look nice on a vector board. I was surprised to see just how neat they really looked.

...WA9VFG

POOR MAN'S UNIVERSAL FREQUENCY GENERATOR

John J. Schultz W2EEY
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As precise frequency control and measurement becomes more and more a part of the amateur radio game, the need develops for test instruments that deliver a wide range of both rf and af signals of high accuracy. It would be ideal if everyone could have a frequency counter and a synthesizer type rf and af generator but that is hardly the case. Most amateurs must utilize their basic station gear along with selected accessory items to test out and adjust equipment. This article describes a very useful accessory item that for a modest cost goes a long way toward having some of the expensive test equipment just mentioned. The item to be described is somewhat like a grid-dip meter in that it is basically a simple type of oscillator but as one gets to know and use it, new uses for it are found and its versatility constantly expands.

Circuit Description

Figure 1 shows the circuit diagram of the test generator. Basically, it consists of a string of SN7490 decade counters which are used to divide down a selected input signal by a factor of 10 or 2. The input signal can come from a 1 MHz master oscillator, a special crystal oscillator for externally used crystals or from any external sine-wave source. The special crystal oscillator which uses a SN7400 will operate with almost any basic or overtone crystal in the hf range. It can be used for crystals in the low frequency and lower VHF range also by a simple modification. One gate of the SN7400 crystal oscillator is used to drive a LED which will indicate that the crystal is oscillating so it serves as a crystal activity indicator as well. When an external sine-wave source is used, it is first coupled through a SN74121 multivibrator. This stage squares off the sine wave so it can better drive the subsequent frequency divider chain.

The frequency divider chain is fixed, although one could easily switch the individual SN7490 units to divide by different ratios when desired. This should be obvious

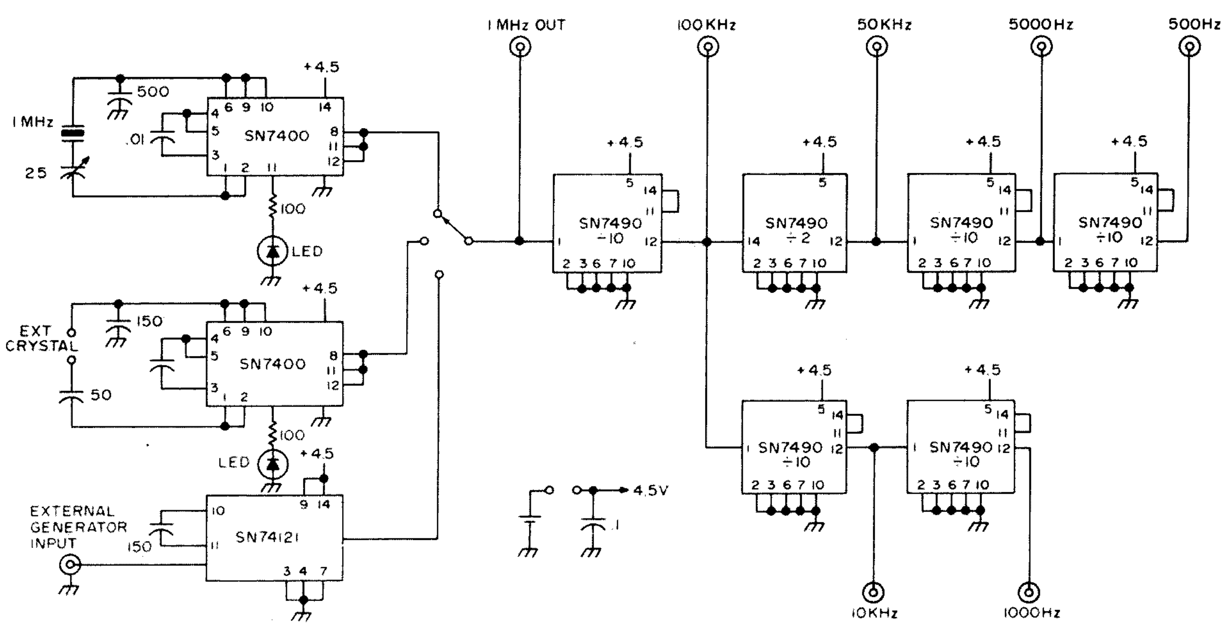

Fig. 1. Diagram of universal frequency generator. Output frequencies shown are for using 1 MHz oscillator.

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07	.70	51	.30	125	.75	177	1.00
08	.30	53	.30	126	.75	180	1.25
09	.30	54	.30	132	4.25	181	6.25
10	.30	60	.30	141	4.50	182	1.25
11	.30	70	.40	145	1.75	184	3.25
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13	1.00	73	.60	151	1.25	190	4.50
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23	.50	83	1.25	155	1.50	194	2.50
25	.50	85	1.50	156	1.50	195	1.25
26	.50	86	.50	157	1.50	196	2.50
27	.80	88	5.00	158	4.50	197	2.50
30	.30	89	4.00	160	2.00	198	4.25
32	.40	90	1.50	161	2.00	199	4.25
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by noting the wiring of the divide by 2 SN7490 with that of the divide by 10 units. However, the variety of frequencies which can be generated then with different input sources becomes confusing and more than would normally be needed.

The fixed divider chain follows the sequence: divide by 10, divide by 2, divide by 10, divide by 10. A separate branch after the first divide by 10 unit goes through two other divide by 10 stages. In the case of the divider chain being driven by the 1 MHz master oscillator, this results in the following output frequencies being simultaneously present: 1 MHz (basic oscillator output), 100 kHz, 50 kHz, 10 kHz, 5000 Hz, 1000 Hz and 500 Hz. With any other frequency input source you can easily calculate what frequency outputs the divider chain will bring in both the rf and af regions. Many surplus crystals will produce interesting frequencies of high stability in the af region that can be used for test purposes.

When using the special crystal oscillator, tor required in picofarads is 500 divided by the frequency of the crystal in MHz. This value need, however, to be only approximate unless you require an absolutely square wave output from the unit.

When using the multivibrator input about a 1½ to 2V peak input, either sine-wave or approximate square wave is required.

Construction

The whole unit can be constructed on a piece of perforated board about 3 x 2 in. and made completely portable if powered by a 4½V battery (Burgess No.532) or just three D cells in series. This arrangement does not provide the absolutely best stability for the 1 MHz master oscillator but unless you intend to use the unit for marker frequency generation in the VHF range, it is a perfectly satisfactory arrangement. Alternatively, one could power the ICs from any standard 5.5V regulated supply used for IC digital circuitry.

I constructed my unit for battery powered operation and enclosed the unit in

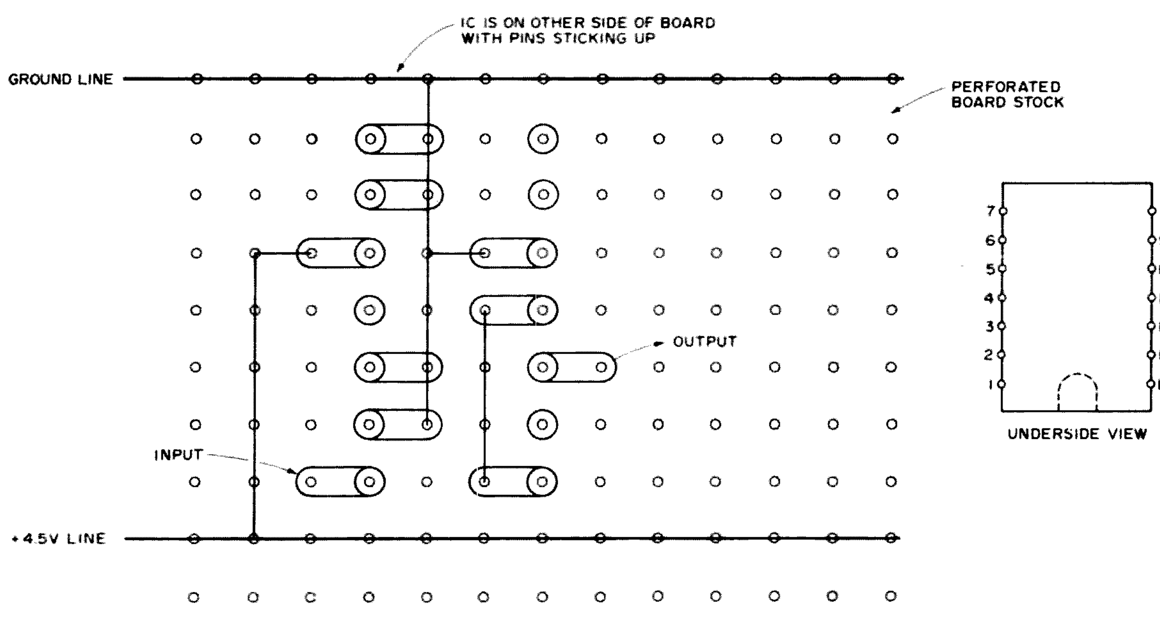

Fig. 2. Perforated board wiring of ICs. One SN 7490 divide by 10 unit is shown wired.

the LED will glow to indicate that oscillation is taking place. As shown with a 150 pF capacitor from one side of the crystal oscillator circuit to ground, the oscillator will work satisfactorily with hf crystals. Its range of oscillation can be extended to lf as well as high frequency overtone crystals by changing this capacitor. The value of capaci-

a small aluminum mini-box. The output of each divider was brought to a pin jack on the front panel of the unit.

One simple way to wire the relatively small number of ICs involved is to purchase perforated board which has hole spacing to fit standard DIP and preferably with a copper pad still left around each hole. The

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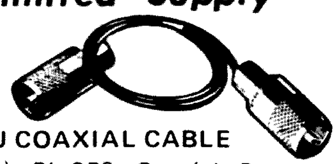

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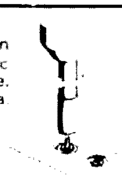

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ICs are then placed on the board and the appropriate pins which either go to ground or to the 4.5V line bent in different directions. The ground line is run along one side of the IC and the 4.5V line along the other side and bare wire used to connect the appropriate pins to either line. Figure 2, illustrates the wiring for one of the divide by 10 ICs. When one starts this process on the board, it will be surprising how fast the wiring is completed. Individual insulated wire jumpers are used to make the input/output connections between ICs. The wiring is not critical and using a receiver to hear the markers, or an audio amplifier for the lower frequency outputs, one should be able to determine quickly if the circuit is working. The frequency of the 1 MHz master oscillator may be brought exactly on frequency using the 25 pF trimmer in the circuit and checking against WWV with a harmonic of the oscillator or by using a counter.

Applications

As I mentioned before, the applications that you can find for the generator really begin to unfold only after you have had it around the shack for awhile. Some of the applications would be:

1. A frequency marker generator for receiver calibration. The markers are usable up into the VHF range.

2. To extend the range of present rf or af signal generators into lower frequency ranges than they presently cover.

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. . .W2EEY

John C. Roos K61QL/N0ZIP
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UNIVERSAL AFSK GENERATOR

This article describes an AFSK tone generator which should interest any RTTY operator. It will work without modification in almost any local loop or with any terminal unit.

I have always felt that the two greatest shortcomings of most AFSK circuits have been cumbersome methods for adjustment of the tones to the correct frequencies and difficulty in adapting a particular circuit to an existing terminal unit. While some of the circuits based upon the Signetics 566 function generator have proved easy to adjust, the loop interface problems still exist. Many of these circuits do not produce a sinusoidal output waveform. This can mean severe adjacent channel interference if the transmitter audio bandpass allows transmission of tone harmonics. I believe that this circuit solves all of these problems and in addition is simple to construct. Circuit features include:

1. Plug-in operation in any RTTY loop independent of loop polarity or grounding.
2. Independent adjustments for each tone.
3. Constant amplitude sine wave output.
4. Excellent tone frequency stability.

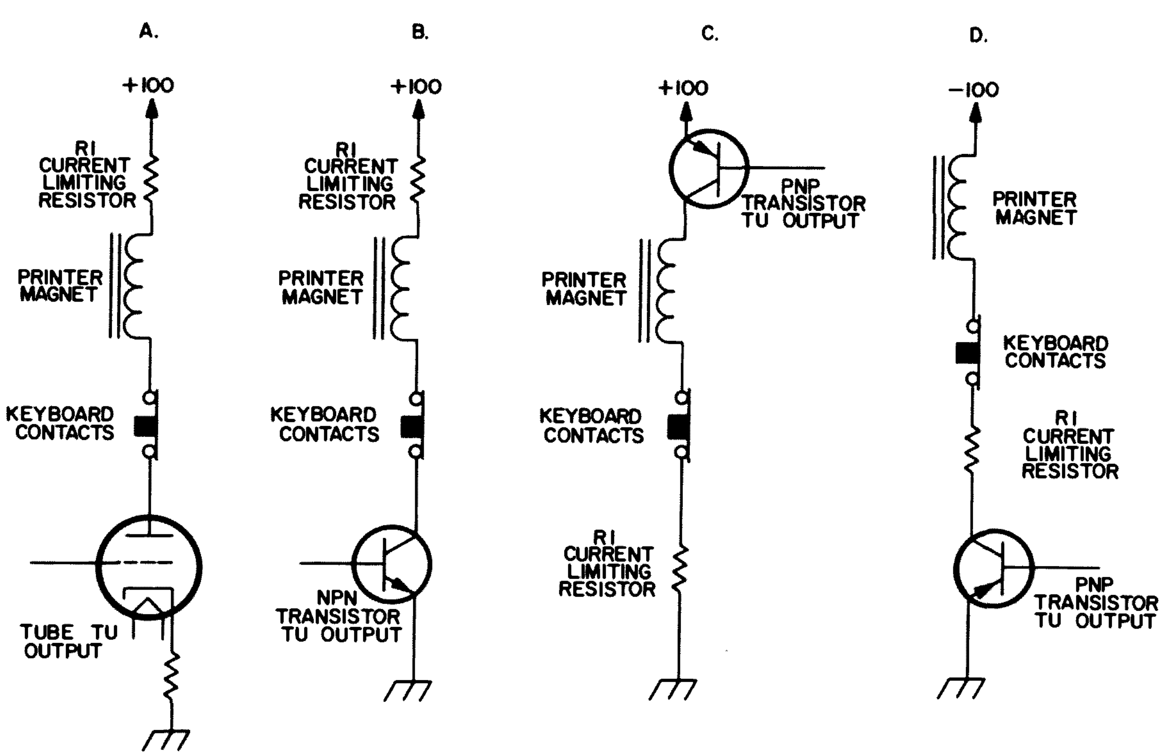


Fig. 1. Typical RTTY loop circuit: a – TU with tube output and positive loop supply. b – TU with NPN transistor output and positive loop supply. c – TU with PNP transistor output and positive loop supply. d – TU with PNP transistor output and negative loop supply.

Front view of the AFSK generator. Controls include the shift selector switch and the power switch. The loop input jack is isolated from ground with shoulder washers.

5. 850 or 170 Hz shift operation with narrow shift ID.
6. Output adjustable from 20 millivolts to 2 volts peak to peak.

The RTTY Loop-AFSK Oscillator Interface

Most amateur RTTY loops are some form of Fig. 1. The machine keyboards and printer magnets are placed in series with the terminal unit output keying element and a high voltage supply. The current limiting resistor R1 sets the loop current to 20 or 60 mA as required by the machines. Normally the power supply voltage is 100V or so and most of the voltage drop occurs across the resistor. The drop across the printer magnets is only a few volts and the closed keyboard contacts have no voltage at all.

This arrangement is used for two reasons. First, the high voltage source decreases the time required for the loop current to built up in the printer magnets for each code pulse. This reduces the error rate of the printer. The second reason is operating convenience. Additional machines such as other printers, reperforators, or a tape distributor may be plugged into the loop without seriously affecting the loop current adjustment. The drop across any additional machine is small compared to the drop across R1 and therefore the loop current change is negligible.

The high voltage loop is all good and well for the machines themselves, but can cause real difficulty when an AFSK oscillator containing tender semiconductors must somehow be connected into the system. Further, each fellow's station is different. Depending on the particular operator, there may be one or more local loops and several terminal units. It is not uncommon to find that the serious RTTY operator has a Mark IV, a Mainline, an ST-6, plus some old military gadget such as a CV-57 . . . all operational and powering one or more machine loops. Because of the differences in the various pieces of equipment, the AFSK oscillator design must contend with systems in which the loop voltage may be of either polarity. The machine end of the loop may or may not be ground referenced, and the loop supply may be anything from 24 to 200V. Thus, a special interface circuit is required to allow operation of the typical AFSK oscillator with each terminal unit.

Having encountered all of these problems when hooking up RTTY systems for myself and for friends, I decided to design a circuit which, like any other piece of RTTY equipment, just plugs into the loop and works. In addition I wanted the circuit to have good frequency stability and a constant amplitude sine wave output.

Two new integrated circuits, the IC optical coupler and a function generator with sine wave output, seemed like just the devices for my application.

The Optical Coupler

Optical couplers are a new type of IC in which a light-emitting diode and phototransistor are integrated in a DIP package. Figure 2 shows the internal circuit of a typical optical coupler IC. The LED and the phototransistor are electrically isolated, but placed such that light from the diode is focused on the phototransistor. Current through the diode causes it to emit light. This light causes the phototransistor to draw collector current. One specification for optical couplers is the current transfer ratio. A typical unit will have a current transfer ratio of 60%. For every 10 mA of current through the LED 6 mA will flow from the emitter to collector of the phototransistor. Couplers are also specified for the maximum voltage

allowed between the LED and phototransistor; 1000V is not unusual. The optical coupler is the ideal device for coupling current pulses from the RTTY loop to the AFSK oscillator without any electrical connection between the two. All voltage, polarity, and grounding problems are eliminated with this simple method.

The Intersil 8038 Function Generator

The tone generator portion of the AFSK oscillator uses the new 8038 function generator IC from the Intersil Corporation.

Operation of this circuit is similar to the Signetics 566 function generator which has been used in previous amateur AFSK circuits. There is one important difference, in addition to the triangle and square wave outputs obtainable from other circuits, the 8038 also produces a *sine* wave output.

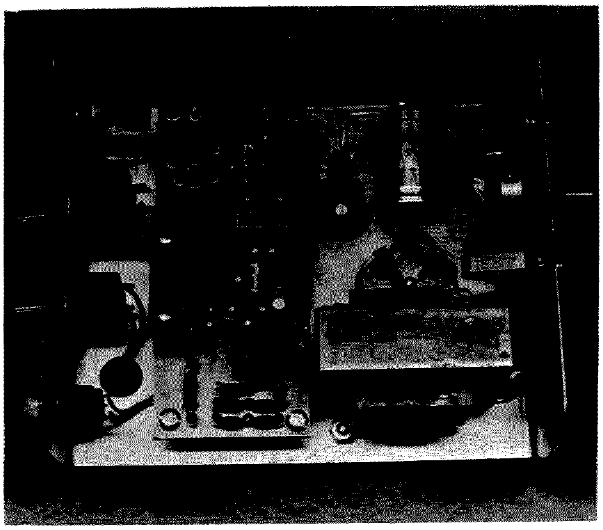
The basic RC oscillator portion of the chip generates a triangular wave form. This is transformed into a sine wave by means of a triangle-to-sine converter integrated onto the same chip. Special trimming adjustments are provided so that the distortion may be reduced by optimization of the converter circuit. Harmonic distortion is about 5% without trimming. Careful adjustment of all of the optional controls will reduce this to less than 1%.

If all of the trimming pots are not used, only three external components are required to make a basic voltage controlled oscillator. The VCO control range is such that a frequency shift of up to 100:1 may be obtained by changing the control voltage input. The output amplitude remains constant as the frequency is shifted.

The chip is available in six versions which are graded on the basis of frequency stability and operating temperature range. The 8038BC used here has a maximum drift of 100 ppm/°C and is usable from 0 to 70°C. This version costs about $8.40 in single quantities.

AFSK Generator Circuit

The AFSK generator circuit is shown in Fig. 3. It is connected into the RTTY loop via a phone jack. In order to make the



Interior view of the AFSK generator. The tone frequency adjustment pots are positioned so that they may be adjusted through the vent holes in the side of the case. The tone output and narrow shift key jacks located on the rear panel with the tone level adjustment pot.

circuit truly independent of loop polarity, the current first flows through a bridge rectifier consisting of CR1-CR4 and then through 6V zener diode CR5. The bridge supplies the zener with current of the proper polarity such that a constant voltage drop occurs across the zener which is independent of both loop current and loop polarity. A ¾W zener is used so that the circuit will operate with loop currents from 10 to 100 mA without damage. The bridge-zener diode combination then drives the optical coupler from an essentially constant voltage source.

The optical coupler is a Motorola MOC 1003 and is operated at an input current to the LED of 10 mA. This is set by R5. The phototransistor or output side of the coupler is grounded to the AFSK generator while the entire input circuit consisting of the bridge, zener and the LED are floating. The voltage difference between the loop and the AFSK circuit can be up to 500V before the coupler would be damaged.

The phototransistor drives the tone generator circuit via Q1 which operates as logic inverter to cause the frequency shift to be in the correct direction. Normally, the MARK (or closed loop) tone is 2125 Hz and the SPACE (or open loop) tone is either 2295 or 2975 Hz. The frequency shift is upward when the loop current is broken or

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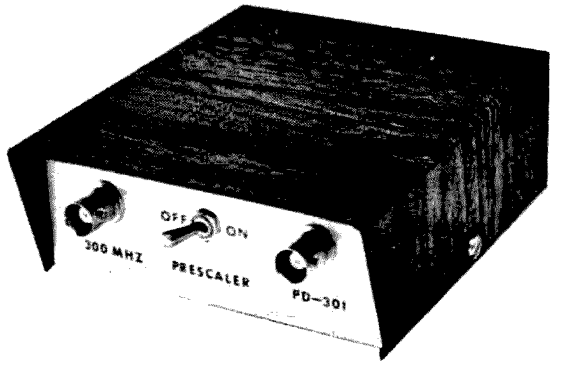

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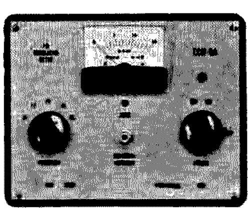

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keyed by the keyboard pulses. An upward frequency deviation is obtained from the VCO chip by decreasing the control voltage input at pin 8. This is done in the following manner: When the machine is at rest, loop current flows and the LED in the coupler is driven on. The light from the LED causes the phototransistor to be driven into saturation such that the collector-to-emitter voltage drop is about 0.5V. Q1 is turned off because its only source of base drive is via the 33K resistor, R6, and about 1.4V are required to overcome the forward drop of CR6 plus the turn-on threshold of Q1 itself. Because Q1 is off, the control voltage input to the tone generator IC is determined only by the voltage divider of which resistor R1 is

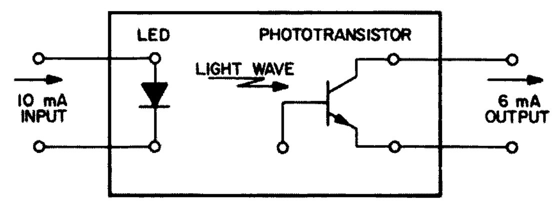


Fig. 2. Internal circuit of optical coupler IC. The input and output devices are completely isolated from each other. 10 mA through the light emitting diode will produce a current flow of about 6 mA from collector to emitter of the phototransistor.

a part. R1 sets the MARK frequency to 2125 Hz.

Each machine code pulse reduces the loop current to zero. The LED no longer has a source of current so the phototransistor in the coupler no longer conducts. The collector voltage rises until base current flows into Q1 causing it to saturate hard; the collector-to-emitter drop is less than 0.3V. The collector current for Q1 is obtained from the frequency setting pot R1 via resistors R3 or R4. This pulls down the voltage at pin 8 of the function generator IC and causes the frequency to shift upward. Switch S1 selects either R3 and its associated fixed resistor for 850 Hz frequency shift or R4 for 170 Hz shift.

Adjustment of the 100 cycle shift for CW ID is provided by R2, which is switched to ground by the key jack.

The basic frequency range of the function generator IC is set by R7 and C1. Other

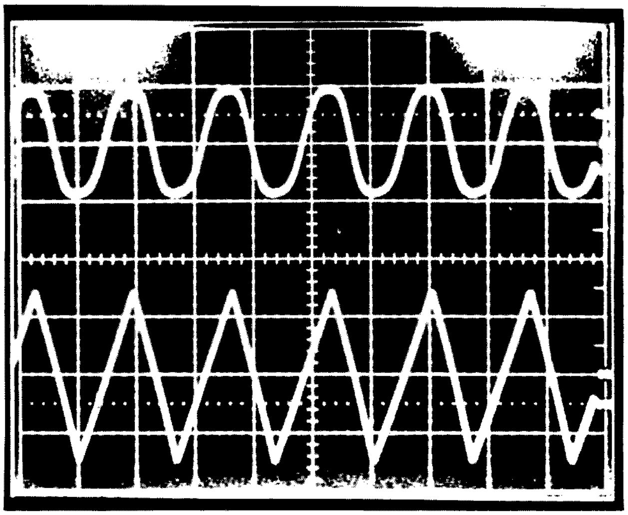
values may be used. The sine wave output terminal of the chip is pin 2. The triangle is present across C1 at pin 10. The sine wave output is AC coupled to the output level adjustment pot, R8, and then to the output buffer amplifier which is a 741 operational amplifier. The 82K resistor, R9, is used to trim the sine converter in the chip for lowest distortion and is a nominal value.

The level set pot, R8, is 250K because the sine converter should not be operated into less than 100K if lowest distortion is to be obtained.

The output buffer, IC2, is operated from a single polarity supply so the inputs must be biased between the supply voltages. R10 and R11 accomplish this for the non-inverting input at pin 3 while the inverting input, pin 2, is biased with feedback from the output at pin 6. This is a unity gain buffer connection which enables the tone generator to drive loads of less than 1K. The output voltage may be adjusted from 20 mV peak to peak to 2V peak to peak. Inclusion of the buffer is a bit of a luxury, but it does assure that the unit may be used with just about any transmitter and the low impedance output is nice if a long cable must be driven.

Power Supply

The power supply section of the AFSK generator is conventional with the exception of the voltage regulator. The transformer and bridge provide about 24V unregulated across the filter capacitor. The regulator is a new single voltage regulator IC from Motorola. This chip, type MC7818CP, is a fixed 18V regulator capable of up to one ampere of output current. It is one of a series of low cost regulators available in standard voltages such as 5, 12, 15, etc. Only three connections are required: input, ground and output. A bypass at the input is a good idea if the lead from the rectifier filter capacitor is long. While the one amp capability of the supply is much more than this circuit required, the ease of application and good performance of the regulator more than justified its use. Particularly since it costs less than $2!



Function generator waveforms. The bottom trace is the triangle wave generated by the RC oscillator portion of the 8038 function generator. The upper trace shows the sine wave obtained from the triangle to sine converter without optimization of the external trimming adjustments.

Construction

I intended this circuit to be a stand-alone unit which could be used with any terminal unit or local loop. Consequently, it is packaged in a small sheet metal case and has its own ac power supply. Others may wish to build it into an existing system from which power may be obtained. Anything from +15 to +20V regulated will work.

The majority of the circuitry is constructed on a small PC card sub-chassis which may be seen in the photograph of the interior. The most frequently used inputs and controls are located on the front panel and include the loop input jack, the shift selector switch, the ac power switch, and a pilot light. Rear panel controls include the narrow shift ID keying jack, the tone output jack, and the tone output level adjustment pot. Be sure to isolate the loop input jack from ground with insulated washers! The power supply is located on the main chassis.

Care should be taken in installation of the regulator IC in order to assure that it is not shorted to the chassis by the mounting screw or a sheet metal burr.

Starting from the bottom of the card, components are arranged in the following order: First is the input bridge rectifier and the zener diode. Just above is a DIP socket containing the MOC 1003 optical coupler which is in a 6 pin package. The pins are counted around the package starting with

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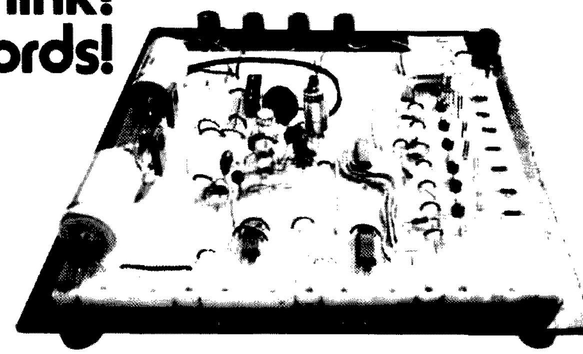

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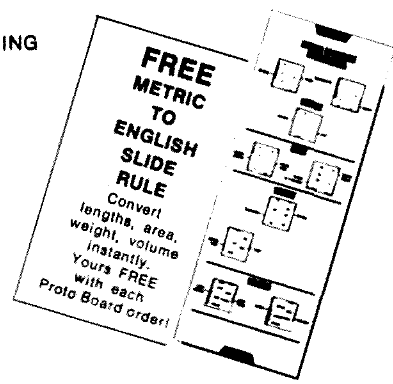

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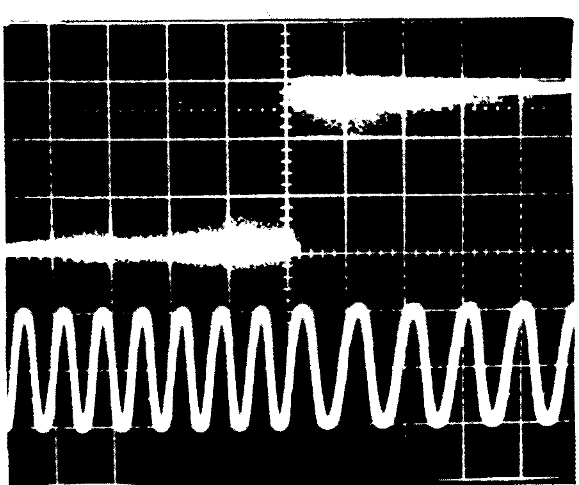
pin 1 at the index dot and are sequential as in the case of a standard 14 pin package. That is, they go 1 to 3 down one side, then jump across to pin 4 through 6 going back up the other side. Q1 is located just above the coupler socket while the frequency adjustment pots are just to the left of Q1.



Frequency shift waveforms. Top trace shows input current waveform switching from SPACE to MARK. Bottom trace shows AFSK generator tone output switching from 2975 to 2125 Hz. No transients are present and the amplitude remains constant. Output is 2V peak to peak.

All of the resistors associated with the frequency adjustments are stable metal film types such as the MIL RN60 series. Conventional carbons may be used but the stability just won't be as good.

I used surplus wirewound trimmer pots for the frequency adjustments. The 20 turn resolution is a real help in setting up the circuit, but again, single turn pots will work if you have a steady hand!

The function generator IC is located above Q1. A 14 pin socket is required for this circuit also. The timing components are located around the function generator socket. I bring the pins on the IC socket through the board via wires to push-in type feedthrough standoff terminals. The components are mounted on top of the card and are easily accessible. In addition, the larger terminals are easier to connect to than the tiny IC socket pins.

The 741 output buffer amplifier is located near the top edge of the card as shown in the picture. All input, output, and power

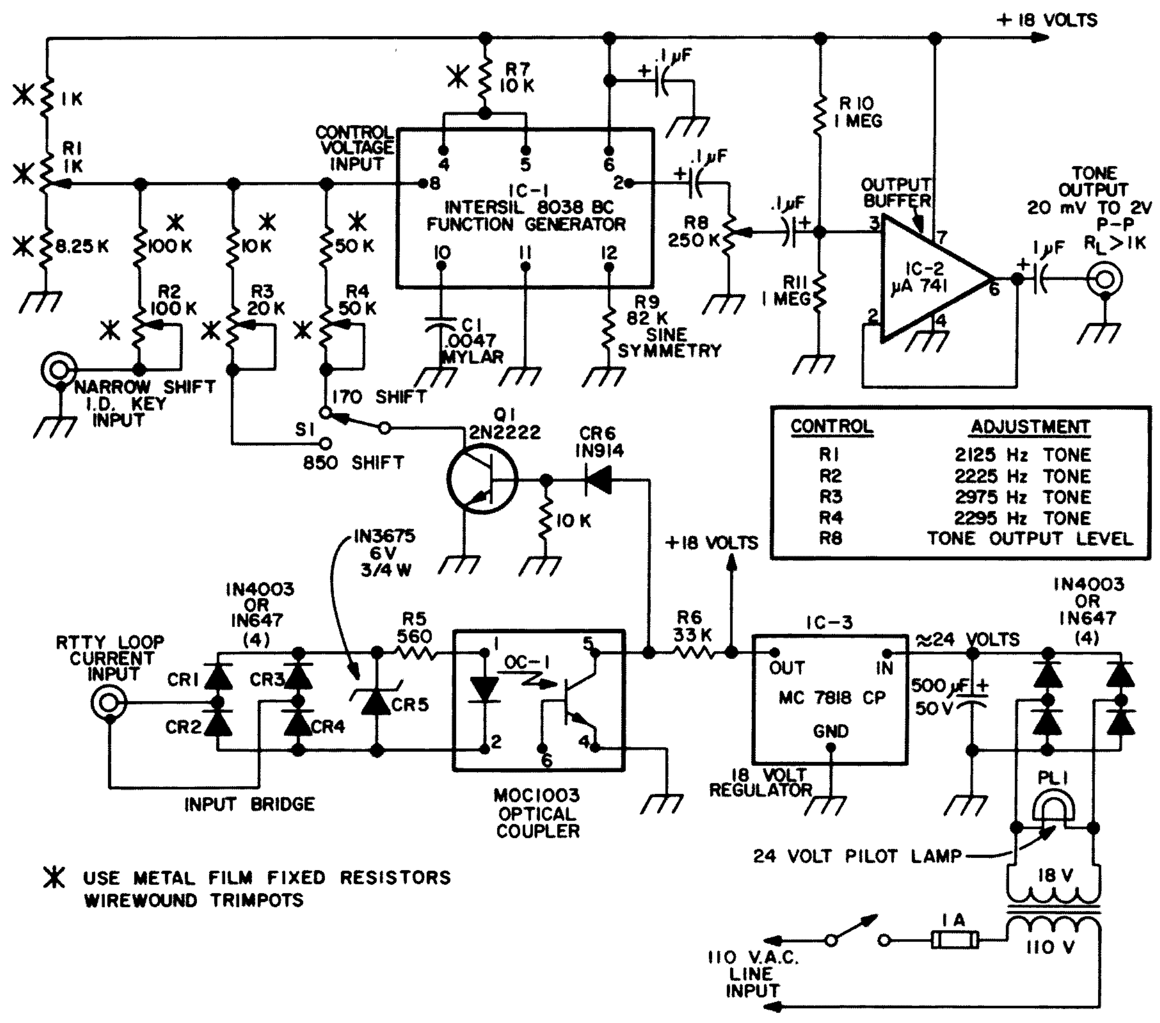


Fig. 3. Circuit schematic of the universal AFSK generator.

connections are made to the feedthrough standoffs on the underside of the card. The card itself is mounted above the main chassis on half inch spacers.

Circuit Alignment

After assembly, take a minute and check the wiring, particularly the connections to the two ICs. More chips are ruined from counting the pins from the wrong side than probably from any other cause.

Remove the 8038 function generator from its socket. Apply power and verify that the IC regulator output is 18V. Then check to see that this voltage is present at pin 6 of the 8038 function generator socket. Also check that R1 adjusts the voltage at pin 8. This voltage should never be less than three-fourths of the supply voltage. Remove power and install the 8038 chip in its socket. We are now ready to set up the tone frequencies. Provide a 20 to 60 mA constant current source such as a RTTY loop. Connect this to the loop input jack. Do not attempt to drive the loop from a constant voltage source such as a lab supply without providing a current-limiting resistor. A small increase in input voltage will cause a large current to flow through the bridge and input zener CR5, since the circuit contains no internal current-limiting resistor.

Set the output pot, R8, to maximum and connect a counter, TU, or other frequency measurement device to the tone generator output.

With loop current applied to the input jack, set the MARK frequency adjustment, R1, so that a 2125 Hz output is obtained.

Set S1 for 850 Hz shift and remove the loop current. Now set R3 for a SPACE frequency output of 2975 Hz. Leave the loop current disconnected.

Set S1 for narrow shift. Adjust R4 to obtain a 170 Hz shift or an output frequency of 2295 Hz. The narrow shift ID setting is all that remains. Reconnect the loop current and verify that the MARK frequency is still 2125 Hz. Short the ID keying jack and adjust R2 to obtain a 2275 Hz output. This completes alignment of the AFSK generator.

Optional Adjustments

The circuit performs quite well as described. The experimentally inclined can add optional adjustments to improve the output distortion so that the sinewave is nearly perfect. I have reduced the second and third harmonic to as much as 50 dB below the fundamental through use of all of the trimming adjustments provided by the chip design.

Three pots must be added. They are connected as shown in Fig. 4. All other connections to the chip remain the same. The 1000Ω pot, R12, is used to adjust the time symmetry or duty cycle of the triangle wave generator by controlling the charge and discharge currents of C1. The pot should be set for a 50% duty cycle using a scope. If a wave analyzer is available, it may be set to null out the second harmonic. This null is quite sharp.

R13 and R14 are used to adjust the amplitude symmetry of the sine converter. One pot adjusts each half cycle. Start with each pot at center position and adjust carefully for best wave form symmetry or minimum third harmonic distortion. This circuit is recommended by the IC manufacturers, but should be used with care so that the pot wiper does not go completely to the end. It might be possible to damage the sine converter by sinking or sourcing too much current to the chip from the supply or ground. Used with care it works fine.

Performance

Like most anyone, I like to make a few tests to see if my brainchild works as well as I think it will. The AFSK generator was subjected to several tests to verify performance. The frequency stability is quite good. The unit is about 5 Hz low when first turned on from cold, stabilizes within 1 Hz after a few minutes warm up in a normal room environment. The long-term stability is a function of the quality of the resistors and capacitors used with the function generator IC. I used MIL RN60D resistors with a mylar film capacitor for C1. Long-term drift after some six weeks is still within a couple of hertz after warm up as measured with a frequency counter.

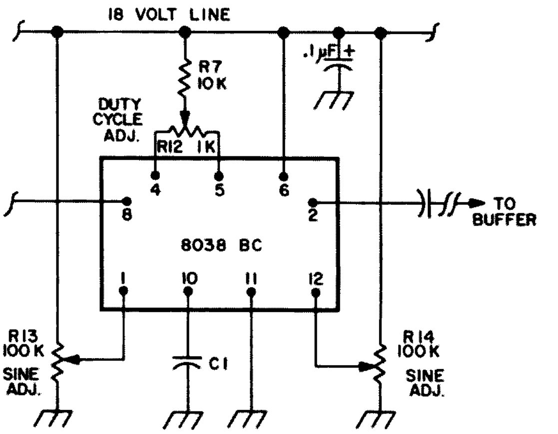


Fig. 4. Function generator with optional controls to reduce sine output distortion.

The output wave form is a clean sine wave and no clicks or transients are present when the circuit shifts from MARK to SPACE. The scope camera photograph shows the input switching waveform on the top trace and the resulting frequency shift on the bottom trace. This particular picture shows the shift from 2975 Hz back to 2125 Hz. There are no transients present and the sine wave amplitude does not change at all.

I also measured the harmonic distortion present in the output sine wave. Without adjustment of the 82K resistor, it is about 5%. Careful trimming will reduce it to below 3% which is good enough for most amateur RTTY applications.

The optically coupled input circuit worked quite well. The shift from MARK to SPACE occurs as the loop current drops below 5 mA which leaves plenty of margin for the fellows with 20 mA loop systems. The unit is truly universal. It does work with any local loop or TU, provided there is sufficient loop current.

. . . K6IQL/NØZIP

Robert Perlman WB2VRW
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Hudson, New York 12534

A CHEAP TEN MINUTE TIMER FOR THE SHACK

In his editorial for the month of August, W2NSD/1 commented on the amateurs' habit of identifying every two minutes. Not only is this habit unnecessary, but it's annoying, as well. Fortunately there's an easy solution in the form of a timer using one IC (Signetics NE555) and a handful of other components. Practically every repeater control circuit recently appearing uses some NE555s in the timing line, but relatively little has been said about its use by the average amateur. There's certainly nothing novel or original about the circuit that follows, as a similar circuit appears in Signetics' catalog. But many hams don't have access to catalogs and the like, and this article is meant for them.

The circuit is shown in Fig. 1. In the wiring configuration shown the NE555 acts as a monostable multivibrator. The timing is determined by R1 and C1, where the length of the timed interval is equal to 1.1 R1C1. It should be mentioned at this point that it's necessary to use a low-leakage capacitor for C1, or else the length of the interval will differ considerably from the value given in the equation. Also, be sure that R1 is less than 20 meg-ohms.

When S1 is pushed, pin 3 of the output goes high, and remains so until the end of the time period. If S1 is pressed during the time period, the timer resets and begins counting a new interval. Pin 3 can source or sink 200 mils, which means that any device which draws up to 200 mils at 9V can be attached to the pin. If it's desired to have the device on during the timed interval, hook it up to points A and B, and to points A and C if the device is to turn on at the end of the interval.

In my set-up, an LED is used as the indicator. Most LEDs operate on two or three volts, so it's necessary to add a

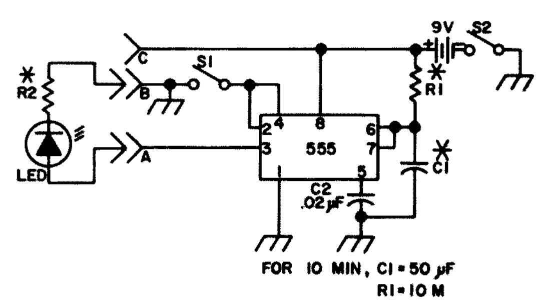

Fig. 1. Schematic of the 10-minute timer. See text for a discussion of R1, C1 and R2.

dropping resistor, R2, the value of which is equal to $\frac{9 - V_{led}}{I_{led}}$; where V_{led} and I_{led} are the LED's operating voltage and current, respectively. The same formula holds true for any device which operates on 9V or less.

...WB2VRW

James E. Taylor W2OZH
1257 Wild Flower Drive
Webster NY 14580

A LOW FREQUENCY PHASED ARRAY

As a confirmed 80m type I have always resisted the urge to put up a truly superior antenna system for that band. Finally, last summer I decided to respond to the creative urge by constructing a system which would offer advantages over a simple dipole and which would also include sufficient flexibility to permit direct experimental comparison of a number of antenna configurations which are of interest. This article reviews the approach, the results and the current status of those experiments.

This antenna system provides effective gain and front to back ratio on 80m with switch-controlled directivity and angle of radiation.

The Approach

Consideration of space limitations (2/3 acre) and other practical constraints led to the choice of two parallel dipoles as the basic elements of the array. Since it was desired to switch to a unidirectional pattern and also to control the angle of maximum radiation, direct feed, rather than a parasitic array, was chosen.

Reference to the radiation patterns in the handbooks shows that a unidirectional cardioid (heart-shaped) pattern can be obtained in an end-fire array of two parallel elements, with a spacing of $\lambda 1/4$ and fed with a 90° phase difference. The radiation pattern in this case is a reversible cardioidal pattern with maximum gain in the direction of the lagging dipole element. This cardioidal arrangement was chosen as the basic horizontal directional array with other related options available bv switching.

It is of interest to provide, in addition to the reversible cardioid, a 45° lag (higher radiation angle), a 0° lag (highest radiation angle – 90°), and 180° lag (8 JK configuration – low angle, bi-directional) and, for comparison purposes, each of the two dipoles separately. This is a total of eight different pattern options!

Still in the experimental stage is an attempt to achieve the same options using ¼λ vertical radiators. Thus far, with the ground system available, the performance of the vertical system is uniformly inferior by about 10dB.

The Circuitry

The circuitry for the horizontal and vertical phased arrays is shown in the schematic diagram, Fig. 1. Instantaneous switching from one pattern to another is achieved by only three switches: a main selector switch S, the reversing switch X, which permits 180° phase reversal, and the 4PDT switch for changing between the horizontal and the vertical arrays.

For purposes of description the system will be treated under the following headings:

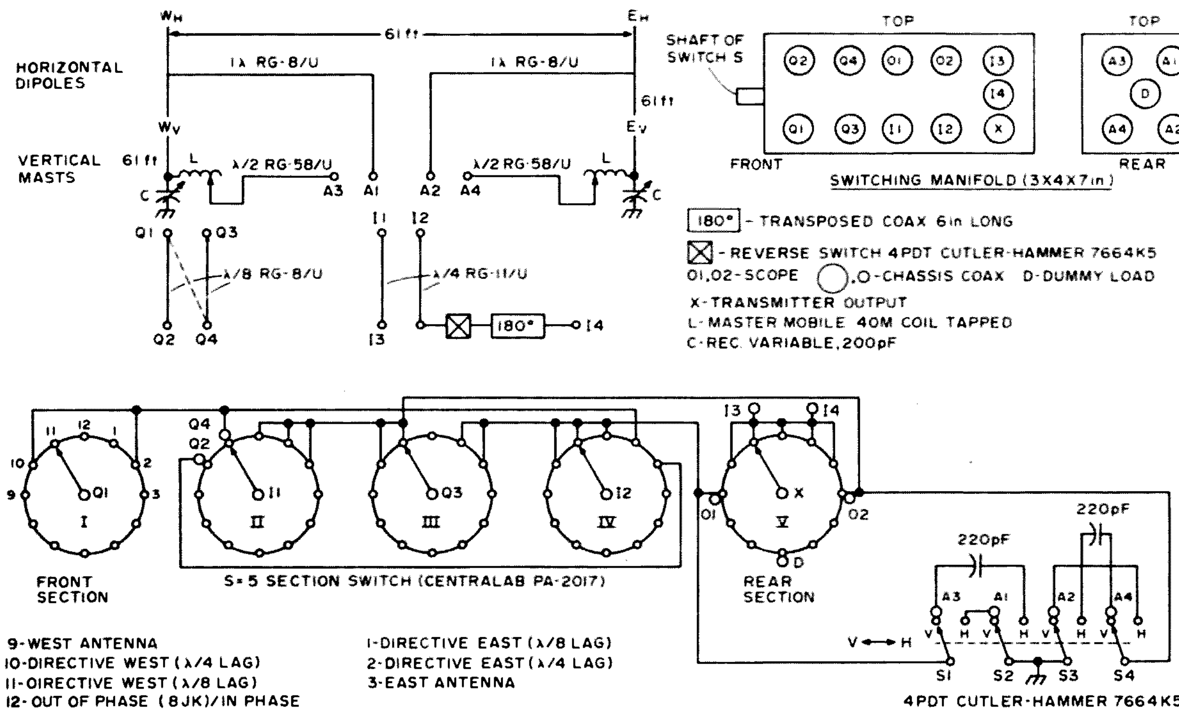

Fig. 1. Horizontal and vertical phased array circuitry. Only three switches need be used for instantaneous switching. See text for details.

The Horizontal Dipoles; the Verticals, Impedance Matching and the Switching Manifold.

The Horizontal Dipoles

The original installation utilized two dipoles as described previously.[1] The centers were 14.02m above the ground with a horizontal spacing of 18.6m. The RG8/U feedlines, one wavelength long, were inside the masts with the balun action and lightening protection as previously described. This original arrangement gave very good operation.

However, since it was desirable to have the lowest possible angle of radiation the centers of the two dipoles were raised to 18.6m (λ1/4). This was accomplished by lengthening each steel mast by the addition of 9.14m length of 7.62cm diameter aluminum irrigation pipe at the bottom end of the mast. The steel mast is inside this pipe and the overlapping portion is bolted securely by use of .64cm plated bolts through the pipe and mast in perpendicular pairs. (No. 8 self-tapping screws in the steel mast served to space the mast within the pipe radially before the bolts were put in place.)

place.)

No data could be taken for comparison of these two heights but it is assumed that the 18.6m height yields a somewhat lower angle of radiation for each pattern option.

The Verticals

The 18.6m foot masts are fed as top-loaded verticals. The horizontal dipoles are connected to the top of each mast and the two halves of each dipole are connected together by shorting the opposite end of the 1λ feedline.

Referring to the diagram, all of these connections are switched by means of the 4 PDT switch. This permits the selection of all of the vertical phasing options by the selector switch S just as for the horizontal system.

The resonating and impedance matching of the verticals is accomplished by the capacitors C and the inductors L. A noise bridge was used to insure adjustment to 52Ω resistive input at 3.955 MHz.

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The 220 pF fixed mylar capacitors connected across the feedlines of the verticals, during use of the horizontals, serve to tune out residual reactances for optimum SWR to the horizontals.

When full lightening protection is desired the bottoms of the masts are connected directly to ground by means of copper jumper cables. With this connection the horizontal array can be used with dc paths to ground from both sides of each dipole, giving full protection against build-up of static charge.

Impedance Matching

The feedline input impedances are 52Ω resistive at the resonant frequency (3.955 MHz). It is necessary to switch-in phase lag by inserting a length of 52Ω line in either of these feedlines, as desired, and to feed equal currents to both dipoles while maintaining a 52Ω match at the transmitter output.

This is accomplished by use of two ¼λ transformer sections of RG11/U (75Ω) coax. These serve to transform the 52Ω antenna input impedance up to 108Ω by the relation:

$$Z_{input} = \frac{Z^2\ Line}{Z_{output}}$$

When these two 108Ω inputs are connected in parallel the resulting 54Ω value is well matched to the transmitter output.

The Switching Manifold

The heart of the switching manifold is the 5-section 12-position switch, S. The current rating of this switch is sufficient to handle the full power as long as the transmitter power is removed before the switch position is changed. As the diagram shows, the system can be switched from the west antenna alone, at the 9 o'clock position, through the various angles of radiation to the east antenna alone, at the 3 o'clock position.

The reversing switch permits instantaneous switching of patterns, for example, from east to west, without having to turn the selector through the intermediate positions.

Only four of the twelve switch positions are not used: 4, 5, 7 and 8-o'clock. The 6 o'clock position is used for a dummy load.

The switches are mounted in the 7.62 x 10.16 x 17.78cm aluminum chassis box with the sixteen coax sockets as shown. The box is mounted under a projecting top of the operating desk. The four lengths of coax used for matching and delay lines are wound on a wooden reel and placed inconspicuously behind the desk.

The connectors 01 and 02 provide inputs to the vertical and horizontal plates of an oscilloscope for a lissajous display of the inputs to the two antennas. (The integral scope in the CE 100V transmitter is used at W2OZH). Thus, the phasing and the amplitudes of the rf voltages can be continuously monitored, allowing any change in either antenna to be immediately noticed.

The scope shows a circle for the cardioidal patterns, diagonal lines for in phase or out-of-phase, and a flattened ellipse for either antenna alone. (This pattern is elliptical rather than a straight line due to the rf energy picked up by the non-energized antenna).

Performance

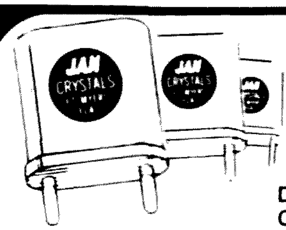
The performance of the array has been all that was hoped for, both for transmission and for reception.

The SWR is consistently low (under 1 1/2:1) for all configurations. The array shows a broadband behavior typical of coupled resonant circuits. The SWR remains low throughout a bandwidth of some 400 kHz – only the phasing varies.

The measured front-to-back ratio is of the order of 15dB and the gain is about 4dB, for both transmission and reception. The improved operation for low angles of radiation is sometimes spectacular – as net of California stations on .3952 kHz could be repeatedly heard and worked during the winter at 9:30PM E.S.T.!

One of the most pronounced characteristics noted has been the great reduction of QRM for reception. The combination of the high front-to-back ratio and the low angle of radiation serves to reduce the level of some signal strengths while increasing the level of others. Thus, there is often at nighttime, a sort of single-signal performance which is very gratifying. (It should be gratifying to the stations off the back of the pattern too!). This single-signal selectivity of the antenna system is particularly impressive when the station being worked also has a low-angle directive antenna system. In this case the directivities complement each other with spectacularly strong signals at either end.

For the type of operation prevalent at W2OZH the two cardioid patterns are used more than 90% of the time. Frequently the out-of-phase (W8JK) bi-directional configuration is used for calling CQ and the proper cardioid pattern is used for the ensuing contact. Under normal conditions there is little need for a linear amplifier, once contact has been established. The principle directivities are in the east and west directions so stations to the north or south are seldom worked. The 0° or 45° phase shifts and the single dipole patterns seldom show consistent superiority over the cardioids. It is interesting to listen to two stations on the same frequency which have about equal signal strengths, when one is to the east and



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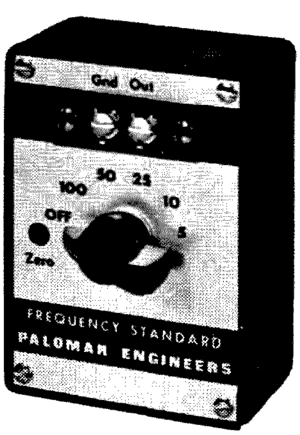

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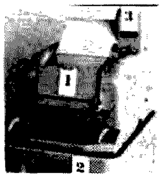


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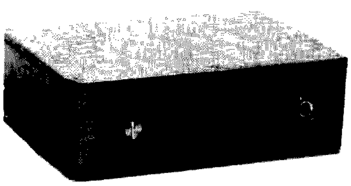

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the other to the west. Either signal can be selected at will by switching the cardioid patterns and the unwanted signal is barely audible in the background!

Such an array would be a great boon to stations located on the coasts as the 3dB of power wasted out over the water could be largely utilized.

The only disappointment thus far has been the consistent weakness of signals from the vertical antennas. The separate vertical antennas are typically down about 10dB compared with the horizontals and this inferiority carries over to the vertical array, regardless of direction or distance. The poor performance of the verticals is attributed to ground losses, with attendant high radiation angles, in spite of the fact that a parallel grid of about 1066.8m of ground wire is used. Perhaps this explains why so many writers describe their 80m vertical constructional features at great length with hardly any space devoted to results. Maybe the results were unprintable!

Weather and motivation permitting, I plan to experiment further with improved radial grounding and I hope to get some meaningful quantitative comparisons. Meanwhile I will be skeptical when I hear of a "superior" 80m vertical with only a modest ground system.

Conclusions

A 2-element horizontal phased array for 80m has been constructed with a total of eight pattern options available by direct switching. Operating results have confirmed the expected gains and front-to-back ratios. The performance of the unidirectional cardioidal patterns has been particularly effective, especially when the station being worked also has a directive antenna system.

Preliminary results using a vertical array with similar pattern options have not been encouraging, apparently due to high ground losses. Further experimentation on this system is planned.

W2OZH

[1] "Construction of a Balanced Dipole Antenna;" 73 Magazine, October 1972; P. 57ff. James E. Taylor.

Bill Hoisington K1CLL
Embassy Village
Muntinlupa Rizac
Philippine Islands

DC ISOLATION

It is best to plan ahead a little for the dc organization of your complete solid state portable UHF station so that you don't find yourself connecting a negative battery terminal to a box that already has the positive wire on it. It happened to me!

There are a few units involved you know, like a low-noise rf stage, a second rf stage for image reduction, a mixer, a local oscillator, first i-f, tunable i-f, selective i-f, af amplifier, crystal-controlled exciter, rf power stages, and modulator. These are taken up and examined in turn as we deal with the bypassing and dc ground question. Good working examples of dc isolated 432 MHz amplifiers are detailed.

The dc question. Nowadays, with solid state devices, we're right back at the old stand where the 201A tubes used to have us – $5 each, 6V directly-heated filaments, and storage batteries. With solid state converters, rf stages, i-f strips, exciters, rf power amplifiers, modulators, and cables, you've got to make up your mind before you start building whether you're going to use a positive or negative ground. The dc ground deal is further complicated by the bypass question as you go up through UHF toward microwaves.

The low frequency units can be arranged pretty well with those little electrolytic and high K ceramic bypass capcitors (see tests on same later), but where trouble really starts is in the transition range near 432 MHz. Here, and increasingly so as you go on up through to 1296 MHz, no leads can be tolerated on the bypasses. You *must* use flat built-in capacitors.

We will take you through the whole bypass and isolation story, from 135 kHz up into microwaves, so that you can plan your dc ground and modulation affairs *on paper* first.

A list of some of the specific problems follows:

1. The value and size of bypass capacitors, beginning at 135 kHz, because you would like a good low-cost selective receiver, I'm sure.

2. When to use electrolytics and when you can do without them.

3. The UHF transition region, where you

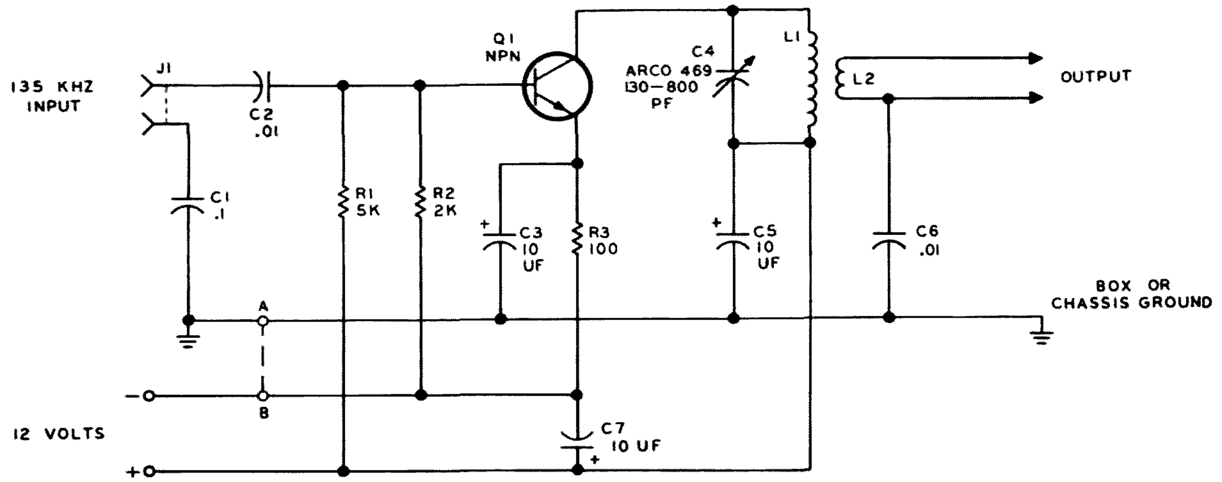

Fig. 1. VLF test circuit. I-f stage, 135 kHz.

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should begin to build your own lead-less capacitors.

4. The connecting cable outer conductor dc question.

5. How to build 432 MHz amplifiers whose groundplane-baseboard, box, and connecting cables don't have dc on them.

6. A word about 1296 MHz and up.

High-K, real small bypass capacitors are invaluable. Lafayette Radio has done a good job on bringing in low-priced subminiature ceramic bypass capacitors. I quote, "500 pF, 75 volts, size 1/8 by 1/8 by 1/16th inch." Now, I ask you, how can you beat that? And "10,000 pF, 5/16ths by 5/16ths by 5/64ths." I have used these little things for almost ten years now, and they do the job. "High-K" ceramic is used. This simply means that the insulation material has a high dielectric constant compared with air. Like five or six thousand times more! Granted that temperature-wise it changes, but for bypasses who cares? The specs say "Plus 100%" on high temperature, which doesn't matter as long as they also say "minus zero," which means that they don't drop *below* the initial rating. That is, they may increase, but they don't go down, in pF.

Some checks and a test run here on VLF, 10 meters, 2 meters, UHF, and into microwaves may help you to decide what bypass to use at what frequency. It already has helped me with my work.

These tests also tend to answer the question of overall circuit design of a crystal controlled, selective, portable station, for UHF in particular.

VLF. A low frequency i-f stage was checked to see just how much emitter and collector bypassing was actually needed in the kHz range. Figure 1 shows the test circuit, forming part of a low-cost i-f stage on 135 kHz, with a selectivity of a few kHz.

In Fig. 1, C3, the emitter bypass, and C5, the collector return bypass, are the units requiring attention. It was found that C3 needed the largest amount of capacity, working all right with 1 μF, but showing an increase of 5 to 10% in gain with 4 μF. Eight to ten μF was the value finally decided on for both C3 and C5. Subminiature electrolytic capacitors are available from Lafayette Radio which can be used for these purposes. Remember that you do not have the full battery voltage across the emitter resistor. A 6V rating will suffice here for C3.

There are some extremely tiny electroyltic capacitors made in the USA, but they run to more money, and will be taken up at another time.

The ten meter region. This can be of considerable importance because it is a good frequency to use for a tunable i-f when building a crystal-controlled receiver for UHF. Converters are all very well, but somewhere down the line you've got to tune something! Here we will touch on the bypass values needed for the 30 MHz region. After all, no need of taking up a ½ x ½ in. space when a little job 1/8th x 1/8th will do, right? The rf stage was used for this test as being the most susceptible to oscillation due to insufficient bypasssing and also as a base for a 30 MHz i-f strip in case you might need one for higher frequencies, like 1296 MHz.

Figure 2 shows details for an rf stage tested for this parameter in the 30 MHz region. Checking for both rf and i-f usage, because there can be a difference between a

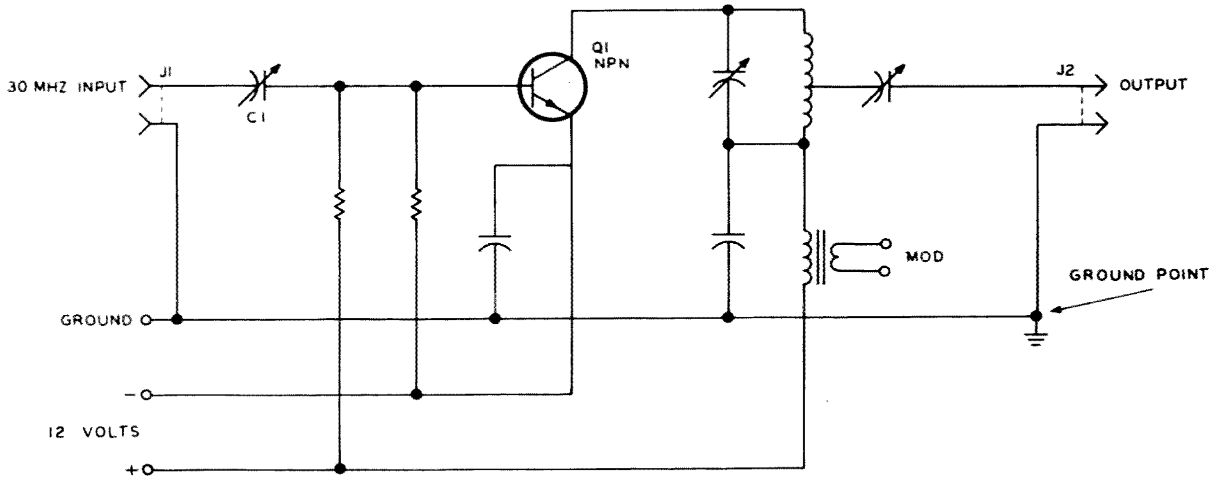

Fig. 2. Test circuit, 30 MHz region. Note. The "ground" point may be connected to either the positive or negative battery terminal, or left open dc-wise.

and up to 144 MHz for rf, that I've included details on the circuit for you. Four variable trimmer capacitors are shown and they are all useful. C1 matches the input cable, along with the tap on L1. C2 tunes L1 and the base tap on L1 completes the input circuit.

The collector coil L1 is tuned by C5, and tapped down for C6, the output matching capacitor. Excellent loading and control of feedback is obtained, with high gain and good stability.

single tunable rf stage and multiple fixed-tune stages as in an i-f amplifier, it appears that the value of .001 which is 1000 pF is sufficient for both C2 and C3. If you want to be absolutely sure, use 5000 pF. They are almost identical in size and price.

VHF, 120 to 144 MHz. I was going to jump from ten meters to UHF, but just couldn't let my old favorite two meters go by because I have ideas on a general purpose i-f strip to follow microwave front ends for

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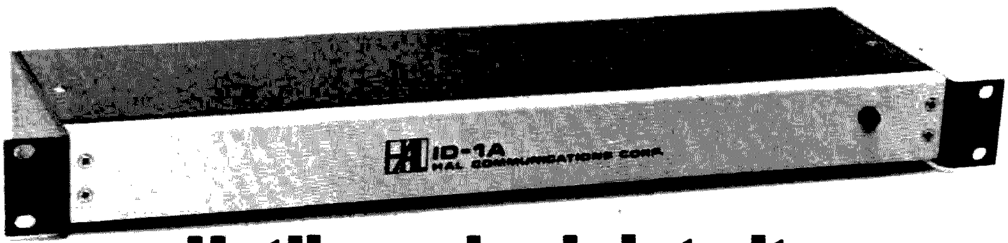

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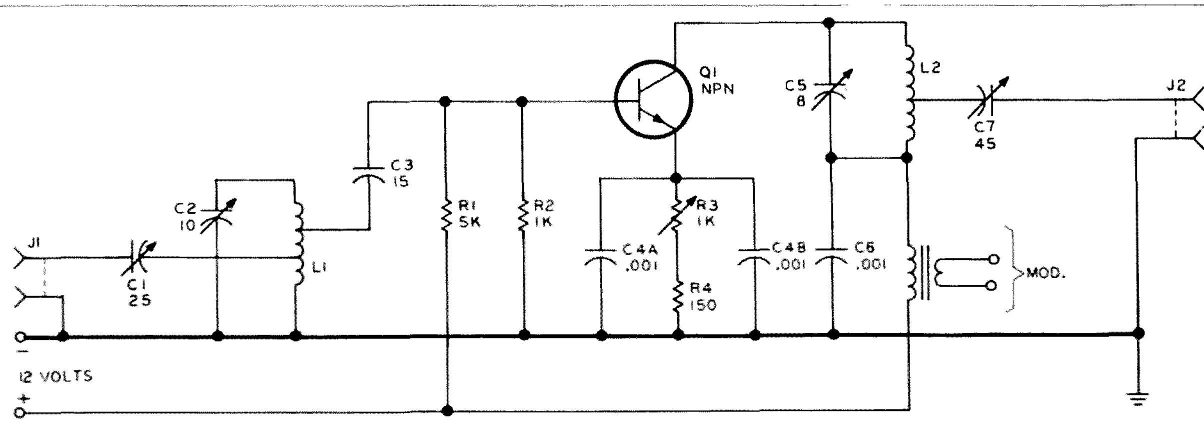

Fig. 3. Excellent 120 – 144 MHz amplifier.

amateurs somewhere in the 100 to 200 MHz region. Very useful.

Fig. 3, shows an excellent general purpose amplifier around six and two meters with emitter and collector return bypasses suitable for use with a negative ground. This turned out to be such a fine job for the region of 120 MHz as a microwave i-f strip, and up to 144 MHz for rf that I've included details on the circuit for you. Four variable trimmer capacitors are shown and they are all useful. C1 matches the input cable, along with the tap on L1. C2 tunes L1 and the base tap on L1 completes the input circuit.

The collector coil L2 is tuned by C5, and tapped down for C6, the output matching capacitor. Excellent loading and control of feedback is obtained, with high gain and good stability.

The emitter bypass showed the preference for more than one capacitor. This business of a jump in gain when bypassing the emitter with a second capacitor is not new. However, a brass plate capacitor such as I use on 432 MHz and up did not help on this 120 MHz amplifier. This is evidently the beginning of a transition region where the

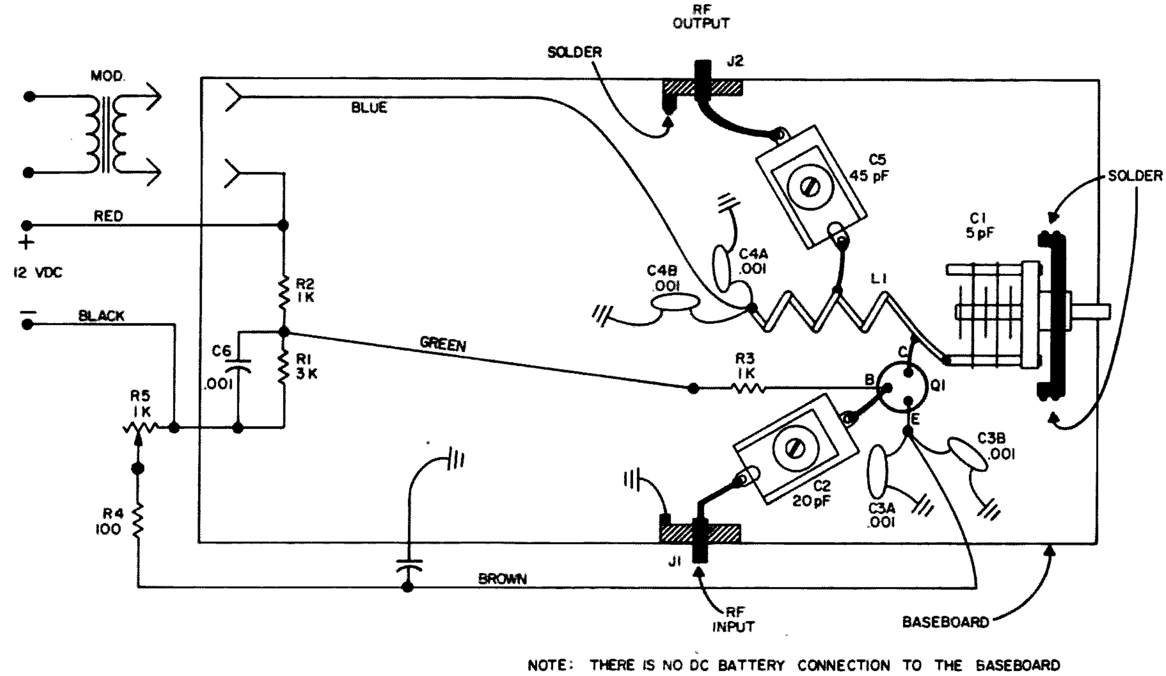

Fig. 4. 432 MHz amplifier using coil and capacitor. Top view.

inductance of the leads needs to be paralleled, but the total capacity still needs to be up in the hundreds of pF.

The collector return bypass did not show this effect as strongly. Only about 2% gain was obtained by the use of a second parallel capacitor. Of course it was installed, because 2% here and 2% there all add up. Retuning the collector is advisable after each such change.

UHF, with coils and boughten capacitors. Now we get to a transition region again, where even those tiny 1/8 x 1/8 capacitors begin to fall down.

Figure 4 shows a UHF amplifier for 432 MHz using a coil and variable capacitor, (see Fig. 7) and regular bypass capacitors, that is, capacitors you can buy retail, with leads on them. Success with an oscillator and a diode receiver using a coil and variable capacitor made me wonder about using them in an amplifier, so back to the bench I went and I'm glad I did; it worked fine. Figure 4 shows the result. As usual a copper-clad baseboard 1¾ wide x 3¾ in. long that fits into a minibox formed the base of this little UHF firecracker.

Collector circuit. Nothing to this one. A brass angle strap to hold the Johnson type "M" model No. 160-102, 1.5 to 5 pF, five plate variable capacitor, was soldered to the baseboard as in Fig. 4 and Fig. 5. Next L1, a three turn coil, yes, even at 432 MHz a coil, was mounted as in Fig. 5, side view.

The KMC $5 H104 was then connected, collector to the coil L1, emitter to rf ground through C3A9 (later C3B), and the base to R3, a 1K resistor, tenth watt. An additional

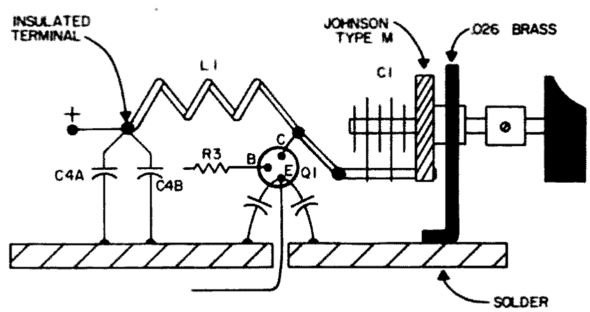

Fig. 5. 432 MHz amplifier using coil and capacitor tuning. Side view, layout of rf components.

ground strap of soft thin copper was soldered from the ground tab of C1 to the baseboard. The input jack J1 was soldered directly to trimmer C2, and J2 was soldered to the output cable matching trimmer C4.

The dc base bias resistors R1 and R2 were connected to the plus and minus battery lead pins, and R3 from the base to the center point.

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Limiting resistor R4 was connected between the emitter and R5, a temporary 1K pot for adjustment purposes, which will probably be fastened later on the front panel of the minibox, or replaced by a fixed value.

C4A and C4B, some of those little High-K jobs I've been talking about, were wired between the low rf end of L1 and the baseboard, and the amplifier was about ready to go, for a comparison with the "Super-strapline" unit.

It fired right up. I had to reduce L1 from four to three turns, add on C3B and C4B and a couple more bypass capacitors C5 and

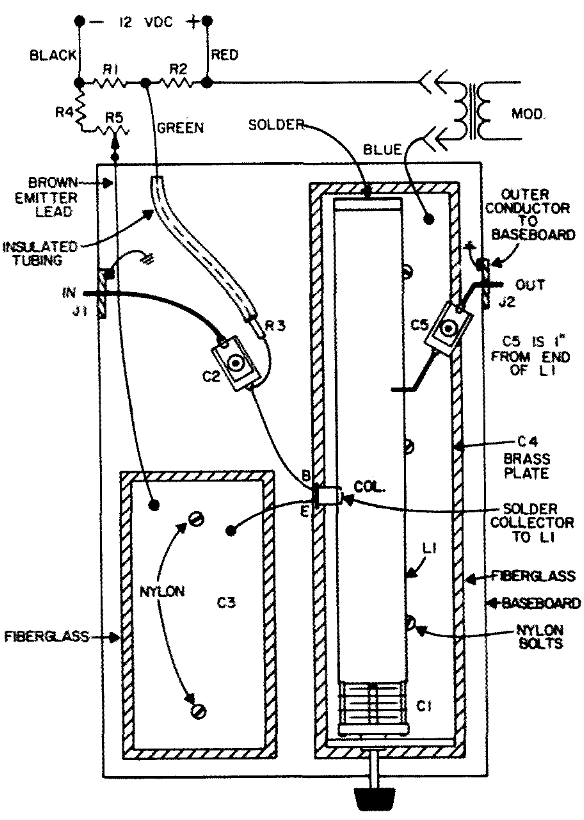

Fig. 6. "Super strapline" 432 MHz amplifier. Top view.

C6 on the terminal strip, and away she went on 432 MHz for an 18 mW output from the doubling type crystal controlled exciter. It also takes 20 mA of current nicely.

Special circuit notes on the use of the additional bypasses. C3B, in parallel with C3A on the emitter, brought the gain up some 4%. The same treatment at the collector return with C4B increased the amplifier gain by about 2%. Don't ignore all these little one or two percents. They can add up

to a large increase in gain, stability, and other goodies.

Comparing several times with the strapline unit, the output of this coil job seems to be only about 10 to 15 percent less. In view of this I hardly know what to advise you. If you like the very best, and have the time and plenty of nylon hardware and fiber glass sheet around, make up the strapline job. If you want to make up the quickest and easiest, build the coil job. They both work well and both have dc isolation on the box and cables, thus being compatible with other units, and are ready for modulating also (they both modulated just fine).

UHf with strapline and no dc on the box or cables. All details are given here because this one surprised me by being the best 432

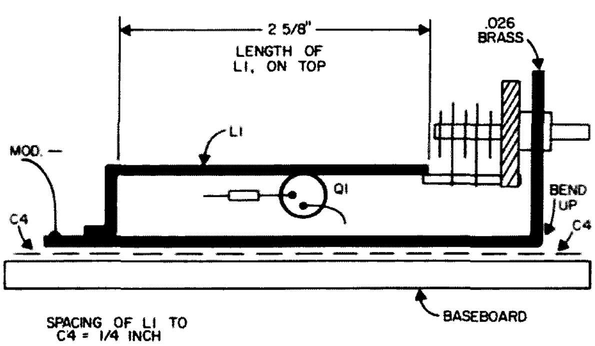

Fig. 7. "Super strapline" 432 MHz amplifier. Side view.

amplifier I've built so far, and it took quite a bit of time to plan, design, and make up the several models. The final circuit is shown in Fig. 6 and it's a dandy. It appears to have over 20 dB of gain and also still fits inside one of those little 2 x 4 in. miniboxes.

Here is how it works and gets rid of the dc on the box and cables. Figure 7 shows the side view of the collector circuit and the bypass capacitor which runs the full length of the baseboard and is then bent up to hold the tuning capacitor C1. This brass plate capacitor serves two purposes; it is the bottom half, or ground plane for the collector circuit strap on the top, and on the bottom side it forms a good solid rf ground capacitor along its whole length, with the five mil fiber glass sheet for dielectric. In this manner it serves also to couple the outer conductor or sheath of the output jack J1 firmly to the collector ground plane *without* making dc contact with it. And that's important if you want eventually to run the whole station from *one* battery.

The second brass plate capacitor C3 is connected to the emitter and serves to ground it firmly rf-wise through the fiber glass and the ground plane and over to the collector return strap, where it has *no* rf on it and is 180 degrees out of phase with the collector, as it should be for an amplifier. Remember that voltage is relative, and that phase is simply the time relation of one event to another. At one instant (rf-wise) the collector is positive and sees a negative emitter. At the next half cycle the collector is negative and sees a positive emitter. During all this time the emitter should stay still with no rf on it. It will be this way if you make Cc and Ce correctly, as shown. At the same time Ce acts as the connector from the emitter, through the groundplane-baseboard, over to the outer conductor side of J1, again without making any dc contact. So both Cc and Ce serve as double-purpose capacitors, and this is at 432 MHz I might remind you. As a matter of fact, after I had built the final model and tuned it up on 432 and had it working, I started to check the dc device voltages and found the meter wouldn't work. Why? Because there wasn't

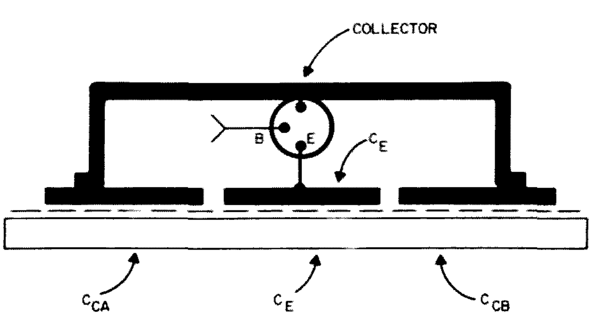

Fig. 8. Proposed half-wave line amplifier, 1296 and 2300 MHz.

any dc on the baseboard or cables. I had to go into Ce and Cc before I got to the dc. Of course there are no dc connections to the ground plane, but it was surprising at first.

You may or may not need this much dc isolation, but there it is. You can connect the negative battery terminal to the baseboard or not, as you wish.

Finishing with the circuit, the base input is untuned but is somewhat matched to the cable by C2, which you will find very useful.

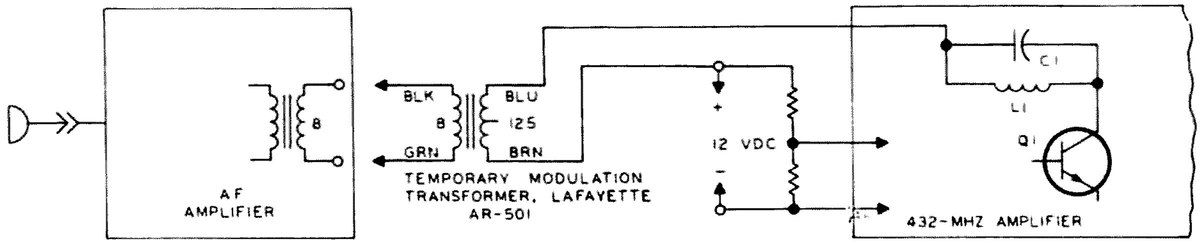

Fig. 9. Modulation test. 432 MHz.

This particular amplifier is intended to be driven by just a few millwatts from a crystal controlled exciter, so the base has considerable dc bias on it. If it is used as a second stage amplifier with more drive you may operate it without any dc bias other than the positive swing of each input cycle, and some charge on C2, the base input coupling capacitor.

The output capacitor C3, along with its position on L1, matches the output cable to LI, and you will also find this one very useful, as it varies the working output load on LI.

I find something like 20 mW output from this amplifier for about 1 mW input, which is enough from today's $5 device at 432 MHz.

1296 MHz and up. Figure 8 shows the proposed dc isolated collector circuit for the "1296'er" amplifier. No further details as yet available, because I haven't built it yet. I will soon, though!

Modulation voltages. There isn't too much to say here so far because I've been listening to it and the modulation "sounds like broadcast," as they say on the air. This is using the tried and true method of a diode detector, a high gain transistor af amplifier, and a pair of well-padded earphones. This keeps the sound of your own voice from reaching your ears through the air which would drown out the desired voice channel which for this test should come through the microphone, modulator, modulated rf power amplifier, and over through the air to the diode receiver, af amplifier and headphones.

Figure 9 shows the modulation hookup which is very straightforward as it was planned to be when the rf amplifiers were designed. Note the dc isolation available between the two windings of the modulation transformer. This is good because the modulator secondary has to be connected to the plus battery terminal.

The Lafayette AR-501 has an 8Ω secondary which connects to the 8Ω speaker output winding of the modulator. This modulator is a temporary one because when the proper modulation transformer is installed the two transformers will not be needed. Remember we are probably going to climb in rf power at 432 MHz by several stages, each of which will call for a lower impedance winding on the modulation transformer, so it is handy to have transformers with several values of impedance around. I also have a three watt af amplifier waiting to modulate that extra power coming soon.

There are also now on the market some ten or twenty watters for less than $20 which will make good modulators for some real power. That real power on UHF will also cost you real dough so save your pennies if you insist on it. Personally I'm just going to drive up Mt. Monadnock, 2000 plus feet of elevation, which I can see out of the window as I'm writing. I am of course interested in more power and am pestering the semiconductor lads all the time to divert or otherwise make available to us amateurs some devices for a watt or two at UHF at a price that we can afford. Maybe some mass market will do it for us.

Winding up the modulation story, there is also the business of modulating one or more driver stages ahead of the final. This will lower the modulating impedance seen by the modulator still further. But that's all right because the lower the impedance the lower the cost of the transformer. You can get ten watt transistor modulation transformers for less than $5 retail right now. After all, there's not much copper wire in them.

"CQ, CQ, any station on 432 . . . "

. . .K1CLL

Bob Johnston W9WBH
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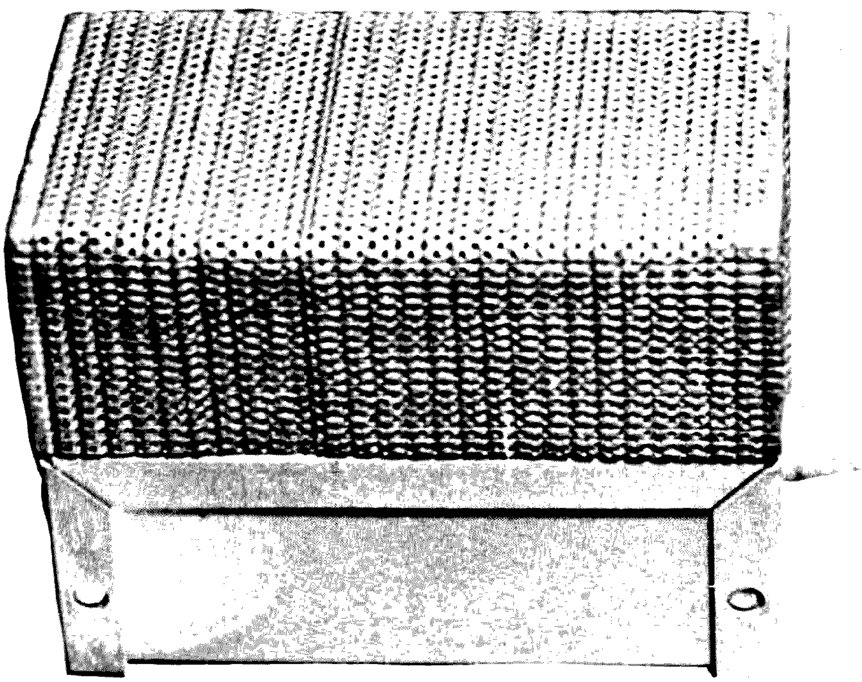
LITTLE BILL



Overall view of the little transmitter with the homemade shield in place.

In these days of rising costs on practically everything, it is indeed a pleasure to construct and operate an efficient piece of radio equipment for pennies, and that is the reason for "Little Bill."

Circuit Description

The rf section of the transmitter, which consists of a crystal controlled Motorola HEP 53 oscillator followed by an RCA 2N4427 rf power amplifier running class C, develops about 1.25 watts output at 28 MHz.

The oscillator stage is a Colpitts type, providing excellent frequency stability with respect to supply voltage and temperature and delivers over 100 milliwatts to the input of the rf amplifier stage.

The power amplifier stage uses a class C common emitter configuration and is modulated through the collector circuit.

A pi-network is used in the output resonant circuit to provide a measure of harmonic suppresssion, and the photographs show a double pi-network which was later changed to a single pi. A Drake lo-pass filter is used for additional harmonic suppression,

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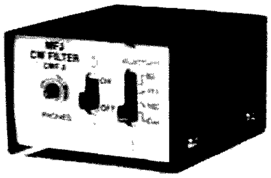

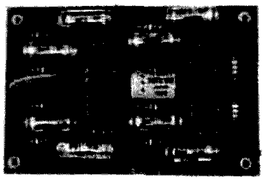

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INDIVIDUAL STAGE Q: 4 (minimizes ringing)
IMPEDANCE LEVELS: No impedance matching required
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as solid state finals are noted for putting out many harmonics of quite healthy levels.

Other types of transistors may be substituted for the particular ones used here, but remember that the final amplifier impedance might be different. This would have to be taken into consideration for modulator impedance matching purposes.

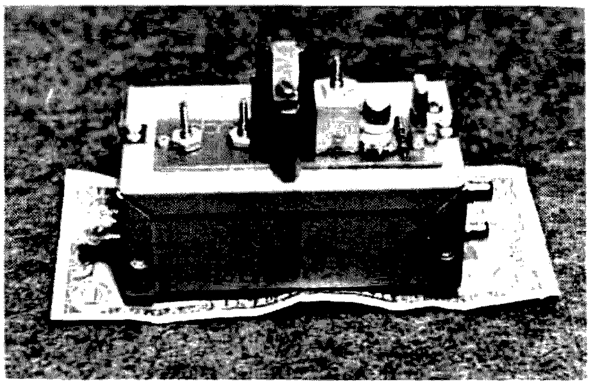
The modulator section starts out with a FET microphone amplifier (HEP 801) to obtain a high impedance input for the crystal microphone used. The output stage is a HEP 593, a 1W output IC having an 8Ω output impedance.

Other audio amplifiers may be used here, such as the Amperex TAA-300, and these IC modules are preferred to standard audio boards for their compactness that lends itself readily to miniaturization.

The output of the audio stage is fed to an 8Ω input modulation transformer that steps this up to the required modulating impedance, being about 75Ω in my particular case.

I wound my own modulation transformer according to formulas given in the Handbook. If an output transformer is available with a primary impedance of 75–80Ω and a secondary of 8Ω this can be used reverse connected.

If you elect to wind your own transformer, then a few words are in order here to assure good modulation results.



Top view of transmitter with shield cover removed to show general layout of components. Finned heatsink on final transistor is home made from aluminum sheet and painted flat black. Stand off supports small strip of plastic to hold heatsink in place and keeps transistor from being damaged if jarred accidentally. Crystal oscillator on right with its coil mounted in an old i-f can and amplifier on left with pi-network. Note small spring clips to hold shield cover in place on each end of mini-box.

Be sure that the core that you use to wind this transformer has enough iron in it so that the core cannot saturate during modulation, and also that there is ample space for the windings. I mention this because the wire sizes used for transistor modulation transformers are larger than for comparable tube devices due to the current demands of the transistor and thus needs more room on the bobbin.

I used an old 5W output transformer and wound 70 turns of No.26 enamelled wire for the 8Ω primary and about 210 turns of the same size wire for the 75Ω secondary.

The final in my particular unit draws about 180 mA. The supply voltage is regulated at 13.5V so my final impedance is about 75Ω (collector voltage divided by collector current). The transmitter runs about 2W input and readily delivers 1W plus output.

With this modulation system, reports have been excellent. Running such low power you need good modulation for dependable contacts. This probably seems like much ado about modulation, but even when the signals dropped to S-zero on someone's meter the report was still Q-5 and that is what really counts. Incidentally, the microphone used here is one of the imported lapel types and cost only 67¢.

Construction

This little transmitter was constructed in a small mini-box measuring approximately 10 x 5 x 4 cm, and a top cover was fabricated from an aluminum front grill from an old transistor receiver, with the sides folded to form a shield and the seams were epoxy cemented and when dry the corners were filed smooth and then given a coat of metallic green spray paint for a pleasing appearance.

The ends of the box are used for mounting the receptacles for the dc power input and microphone and the rf output to the antenna. Two phone jack types are used for microphone and power input and a bnc type

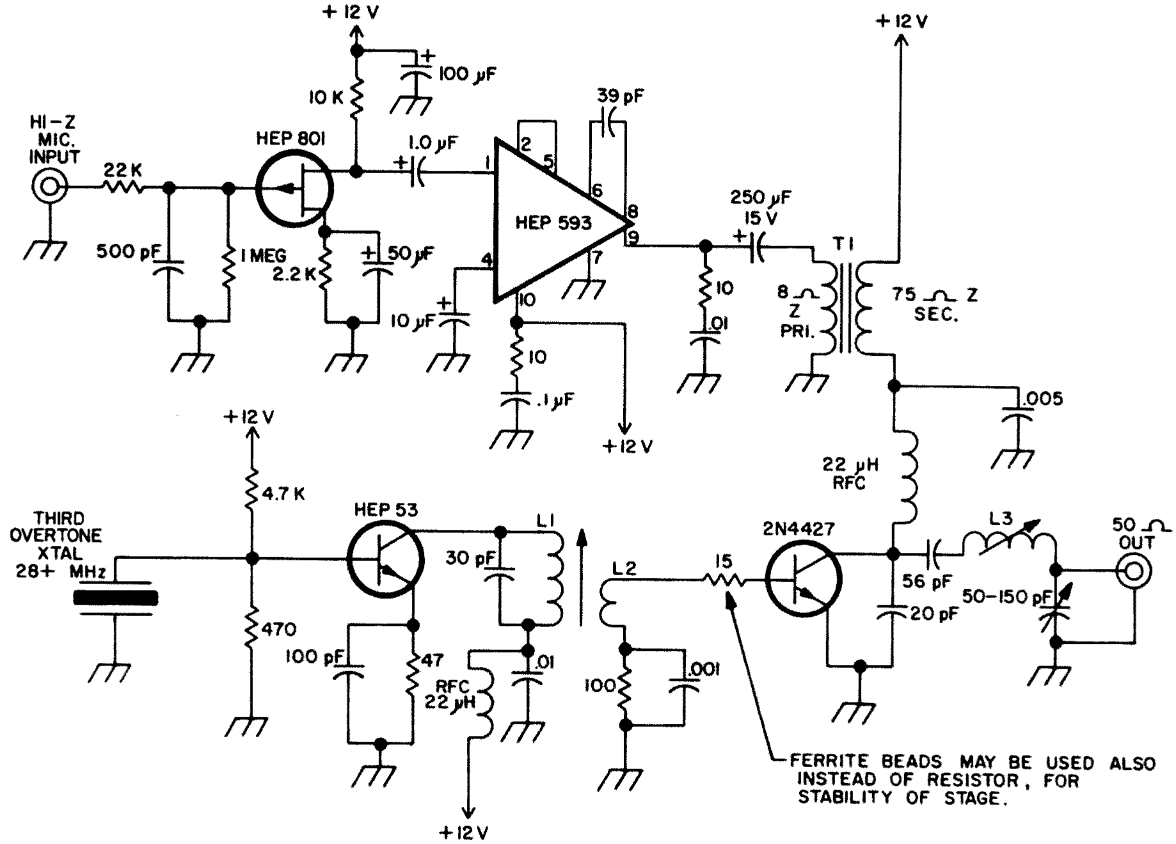


Fig. 1. Schematic of "Little Bill" transmitter. L1 - 13 turns No.28 P.E. CW, L2 = 2 turns link on cold end, L3 = 13 turns No.28 P.E. C.W.. All coils close wound on 6 mm diameter slug-tuned ceramic forms.

connector is used for the antenna to readily accommodate coax cable.

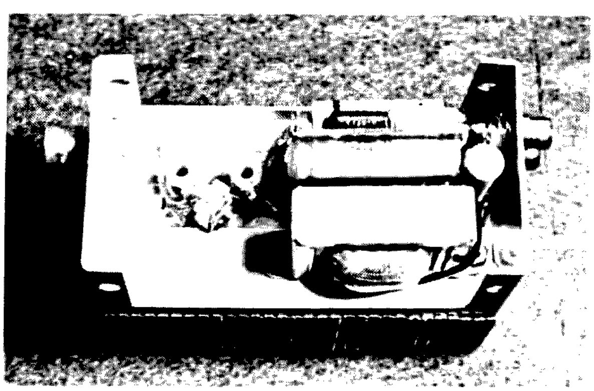
I made two small clips to hold the shield cover in place from scrap pieces of phosphor bronze stock strips, and these not only keep the cover in place but serve as grounding connections for the cover helping to keep harmonic energy from flowing out on the coax and creating unnecessary interference.

The coil forms used were ceramic surplus, just over 6 mm in diameter and tuned with a powdered iron slug. All coils were close wound with No.28 enamelled wire and given a coat of clear household cement.

Tuning Up

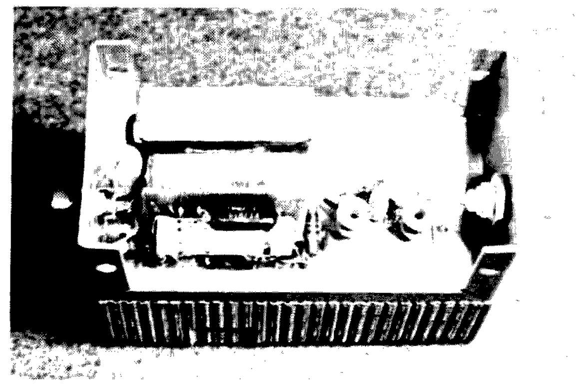
The tune up procedure is very simple and there should be no difficulty in obtaining proper output providing that all parts are good and the circuit has been wired correctly.

Connect some sort of dummy load to the transmitter output, such as a 51Ω resistor (carbon) and a diode and voltmeter, or use a QRP wattmeter as I do.



Bottom view of transmitter showing mounting of audio board and modulation transformer. Capacitor at extreme right near power connector is 100 µF unit across power input used to provide good filtering and low impedance when batteries are used. Parts layout is not critical here but try to keep audio stages away from final rf stage as much as posible to avoid rf pick up.

Starting with the oscillator slug and with power applied adjust the slug with an alignment tool for output indication on the meter and turn the circuit on and off several times to make sure there is reliable starting of the oscillator each time. Then adjust the amplifier slugs and the pi-network capacitor for maximum output. Be sure to use heatsinks on the rf amplifier. I also use one on



Bottom view of transmitter showing parts placement. Note antenna connector on left apron to allow very short lead to pi-network. Photo shows double pi-network originally used but later revised to single pi output, see text. Modulator components shown on right side with board containing all audio parts except transformer which is fastened to box directly.

the audio amplifier in the interests of cool operation and efficiency.

For the final touch-up in the alignment procedure, install the lo-pass filter in the line from transmitter to the dummy load and repeak all stages for maximum. The harmonic content will now be the lowest level and will not influence the output reading.

Transistor output stages are not as tolerant of high standing wave ratios as tube circuits, so be sure that your SWR is kept to a low level at all times.

Results

On the air results were most gratifying. I used a variety of antennas and modulation reports were very good indeed.

Using a ¼λ whip attached to the side of the house about fifty to sixty contacts were made from both coasts and Canada with reports ranging from S-zero to S-9 plus. Always noted was Q-5 copy, attesting to the modulation capability.

With a 2-element beam, South American contacts were made as well as Central America and even the Windward Islands on a CQ!

It has been a real pleasure to operate this little unit. I should like to express my sincere thanks to Sam W9BDM for his patience during all the tests that were made, and for his incessant nagging to make the modulation as good as it now is.

. . .W9WBH

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74C151	3.30	CD4020	5.50	LM370	1.25	CA3086	.45
74C160	3.25	CD4021	4.00	LM371	1.25	3900	.75
74C161	3.25	CD4023	.60	LM372	1.25	4136	2.00
74C162	3.25	CD4024	3.00	LM374	2.00	4250T	2.25
74C163	3.25	CD4025	.60	LM380	1.75	5558	.90
74C195	3.15	CD4027	1.75	LM381	2.00		
CD4001	.60	CD4029	6.00	LM382	1.75		
CD4002	.60	CD4030	1.20	555	1.00		
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3000V dc SUPPLY

Building that new linear for CW, SSTV, or just everyday SSB, you'll find this one whale of a supply built to take it.

Have you ever built a piece of gear with available parts and done an immaculate job, only to have a transformer or component go bad after a period of time? When you go to purchase a replacement you usually find it is sold out or no longer available. So you shop and shop, trying to find something that will do the job and also fit into your cramped dimensions. Perhaps you'll be lucky. I usually am not and end up rebuilding.

The described 3000V power supply incorporates rugged design specifications coupled with generous dimensions that provides versatility in accommodating transformers and related components found on the surplus market.

Construction

The high voltage power supply shown was easily constructed, as all mechanical work can be performed with a metal munching tool, pop rivet gun, good soldering gun, and ordinary hand tools. An electric drill with variable speed control will save much time.

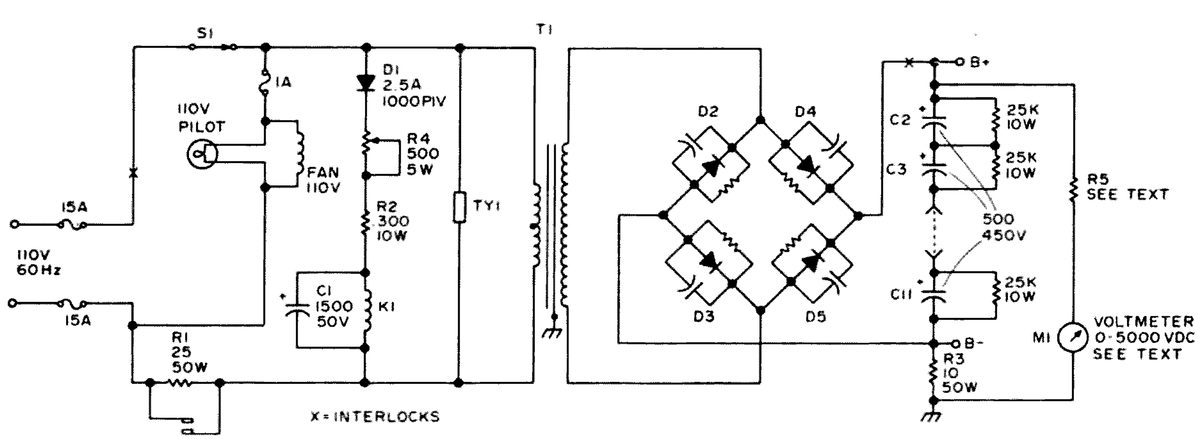


Fig. 1. Schematic of the 3000V power supply. The diode stacks D2–D5 are constructed of 8–2.5A 1000 PIV series connected diodes each. Shunted across each diode is a 470K 1W resistor and a .01 1000V disc capacitor. C2–C11 should be 500 μF with a minimum voltage rating of 450V dc. K1 is a P&B type PR3DY, 24V dc coil with 25 amp contacts. T1 has a 2200V rms secondary with a 500 mA minimum rating. The thyrector is a G.E. 6R520SP4B4.

The main aluminum chassis and front are 33.02cm x 43.18cm x 7.62cm (standard) and the back aluminum wall has a 2 cm inside lip at the top and bottom for attachment to the main chassis and cover. The front chassis and rear wall are attached to the main chassis by generous use of pop rivets. The main chassis is reinforced on the bottom with a thick steel plate with one caster at each corner and one in the middle to support the weight. The line cord is fed to the rear through a steel conduit.

The cover is manufactured by hand bending a sheet of aluminum to tightly fit the chassis assembly and is held in place by sheet metal screws. Right angle aluminum brackets were installed on the back plate along the sides to accommodate the fastening of the cover. Air is exhausted by mounting home air vent assemblies on the sides of the cover. The local lumber yard had the vents.

Before attaching aluminum to aluminum I roughed each contact surface with fine sand paper to assure a good electrical connection. I also connected each chassis and the back together electrically with copper braid.

The front of the supply contains a voltmeter, on-off switch and pilot light. The rear of the supply is designed with safety in mind. The B+ and B– connections are in a minibox with two grometted holes in the bottom. The large insulated feed-through was fitted on a small plexiglass sheet and the hole in the aluminum made extra large to prevent high voltage breakdown. High voltage cables should have a minimum rating of two to three times the dc output voltage.

The diode stacks were made by mounting eight diodes on four pre-punched epoxy paper boards. The insulated spacers for the boards are nothing more than self-tapping plastic expansion tubes, available at most hardware stores. The boards were connected to the spacers and the spacers to the chassis by nylon screws.

The filter capacitors are mounted in holes drilled in plexiglass with a hole saw. The hole was too small to begin with, requiring some filing. The plexiglass is held in place by self-tapping plastic expansion tubes and nylon screws. To prevent the capacitors from arcing to the chassis the area below the capacitors has a sheet of punched epoxy paper board cemented to it – also the cut-out plastic circles were cemented to the bottom of each capacitor.

To keep air circulating a small fan was mounted in the rear of the supply. The fan is fused and the fuse is located in the front under chassis where it can be changed without removing the cover. The ac line is terminated in the front chassis at the switch and at this point the thyrector is also located across the line.

Located at the lower right of the rear chassis is a heavy duty ground connector *which should always be utilized for maximum safety.*

All lettering was accomplished by the application of white dry transfers over black wrinkle paint.

Circuit

The circuit utilizes a full wave bridge rectifier circuit with a capacitor filter of 50 μF. This provides approximately 5% regulation with a 3 KΩ load. Ten 500 μF, 450V capacitors provide a total voltage rating of 4500V.

The high voltage diodes, capacitors, and transformer are protected from excessive current when the power supply is first turned on by a series limiting resistor R1. The time delay for relay pickup is determined by R4, which adjusts the time required for C1 to charge and energize the relay K1 which closes its contacts and shorts out R1. Too much delay causes R1 to overheat. One second proved satisfactory.

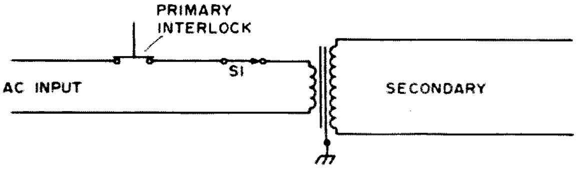
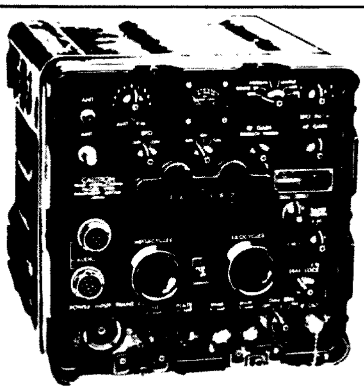


Fig. 2. Primary interlock. When removing cover or panel of supply the primary interlock should open thereby preventing the supply from being accidentally energized. A homebrew spring operated switch or commercial pressure switch works well. The primary interlock must have ample current carrying capability.

The supply also incorporates a voltmeter that measures the output voltage. An inex-



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pensive meter can be utilized as the supply incorporates a resistor multiplier string to increase the range of the basic meter movement, *but never use a meter with a metal zero adjusting screw in high voltage circuits!* To choose the correct value of R5 for your meter, use the following formula:

$$R5 = \frac{\text{full scale desired}}{\text{meter reading in amps}}$$

In my power supply I used a 500 μA meter and wanted to read it to 5000V. The full scale value of .0005 was divided into 5000 and the solved value equaled 10 MΩ.

A resistor is not a high voltage device; therefore to achieve the desired resistance of R5 many series resistors must be used to handle the voltage. I used 10 1MΩ, 1W resistors in series, mounted on a strip of epoxy board, thereby distributing the voltage equally across ten resistors. The epoxy board was mounted to the front chassis on two ceramic insulators.

Before final soldering of my multiplier string, I substituted 1 MΩ resistors as needed until I had a measured 10 MΩ total resistance. The total resistance must be 10 MΩ in order for the meter to read accurately.

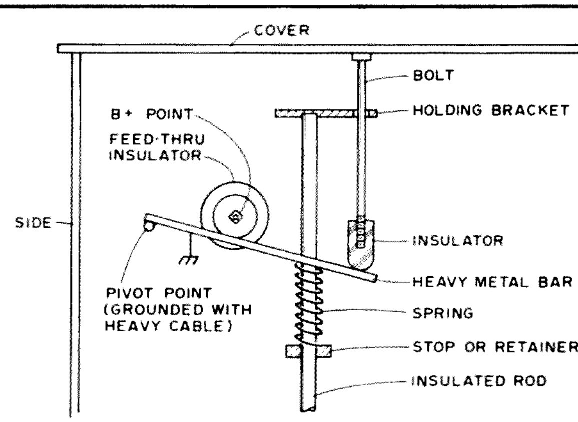


Fig. 3. Secondary interlock. Removing the cover permits the metal shorting bar to move up and contact the B+ point, thereby shorting any dangerous voltage to ground. As long as the cover is removed the B+ point will be grounded. This assembly must be mechanically strong and not subject to movement or bending.

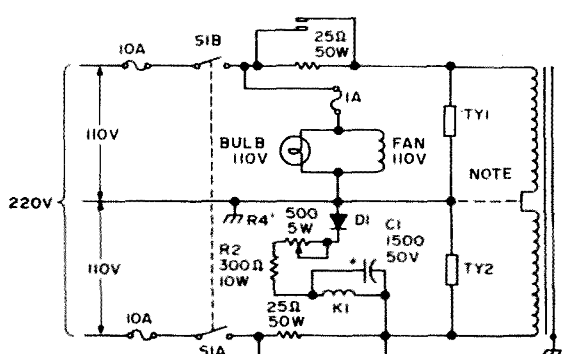
To protect the supply diodes from transients a thyrector-diode assembly is installed at the line input. Also, each side of the line is fused to provide adequate protection to the supply and station line circuits.

Interlocks

All high voltage power supplies should contain an interlock or interlocks. Basically there are two types: the primary interlock and the secondary interlock.

The primary interlock is similar to the power cord assembly on a television receiver. When you remove the back of the set you open the ac line and the television cannot be energized by unauthorized personnel without a special line cord. See Fig. 2.

The secondary interlock (Fig. 3) normally shorts the secondary out thereby discharging any residual charge on the high voltage capacitor string, thereby also protecting the amateur from electrical shock due to an open bleeder or equalization resistor.



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NOTE - RUN NEUTRAL OF 220V TO TRANSFORMER IF OPERATING TWO 110V PRIMARIES IN SERIES
DO NOT FUSE COMMON LINE

Fig. 4. Alternate 220V primary circuit for use with 220V transformers. The components are similar to those used in the original circuit except two thyrectors are used and the relay K1 is a double pole type.

Neither a primary nor secondary interlock alone will give 100% protection, but utilization of both in one supply will come close.

In essence, in respect to safety, it can be said that a power supply that does not break down requires minimum service – therefore the best protection is to build high voltage supplies with generously designed safety factors.

Transformers

This supply can accept transformers with a secondary voltage of up to 2500V rms with no design changes. A 2500V rms secondary will give an unloaded output of 3500V dc. Even at this dc level there is an ample power supply design safety factor. For a transformer with a 220V primary, see Fig. 4 for wiring details.

Testing

When the circuit was completed I checked the wiring and looked for any possible short circuits. Between ground and any positive voltage points I looked for a minimum of 3 cm separation when the insulation was solely air.

I also inspected each electrolytic capacitor to make sure none of the exhaust ports were obstructed by construction. A defective electrolytic or an electrolytic with a plugged or blocked exhaust port can explode violently.

Before energizing the circuit I reviewed the basic rules of safety.

1. Never bypass an interlock.
2. Fuse the circuit properly.
3. Never operate or test the supply with the cover removed or high voltage terminal exposed.
4. Make sure others in the household are aware of the location and operation of the master power cut-off switch so they can disconnect circuit from line in an emergency.
5. Label *all* high voltage points and equipment as such: DANGER – HIGH VOLTAGE."
6. Voltmeter should read zero and main ac line should be disconnected before removing cover or changing high voltage leads.
7. Make sure the family members know the basics of artificial respiration. Many shock victims die of suffocation before professional help arrives.
8. If you don't understand something, get the facts before proceeding.
9. Properly connect the power supply to a good and permanent earth ground.

Even when the circuit has been inspected and rules followed, there is the potential danger of defective new or used components. I cannot overemphasize that a 3000V dc supply with a 50 μF filter is a lethal device. Always assume that *all* points in a circuit of this type are dangerous and proceed with that in mind.

...K8VIR

J. K. Bach WB2PAP
Ivy Hill Road
Walden NY 12586

DIAGRAMS

Do you have problems reading a schematic? Here are some obvious and not so obvious hints on how to do it . . .

If you know some fundamentals and are willing to learn a few conventions, reading circuit diagrams is as easy as pie. You can look at a fairly complex print and say, "From what you have told me, the trouble is here!" and point to a certain component. In a few cases you can't be wrong, and generally it will turn out that you are right if you use care and don't back yourself into a corner.

Back when radio was *wireless*, the connections were shown by a drawing that was photographic in character. If you had an antenna (aerial) and a lead-in and a ground rod and a 2-slide tuner and a crystal detector and a bypass condenser and a pair of headphones, you just drew these things as much like they actually appeared as you possibly could (Fig. 1).

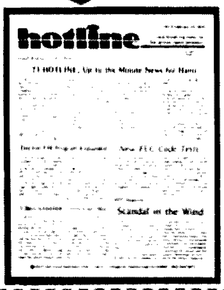
Soon it became apparent that the supporting trees were irrelevant, and that the drawings were uselessly detailed. Down through the years a kind of shorthand evolved which depicted the etherial "soul" of the gadget instead of the fins and tail-feathers.

This was not imposed by some international authority, but evolved through natural growth, and therefore the development has been sound and practical. Occasionally even now a magazine will introduce some innovation in an attempt to outstand their rivals. If it is clear, and helps, everyone will take it up. If it is in the least confusing they get plaintive and abusive letters until they desist and reform.

It is the same with typefaces; they all differ slightly, but they're all clear and easy to read. But you don't, as a rule, examine printing with a magnifying glass. And you just as seldom examine a good print for style and makeup – you are far more interested in what it says.

Figure 2 can be taken in at a glance by any experienced radioman. A is the antenna (the trees are not indicated). G is ground, L

HOT NEWS! for hams...



The premier issue of the 73 HOTLINE, which will be published every other Friday, is scheduled for April 5th. This newsletter will cover all the up-to-the-minute happenings in amateur radio . . . FCC news . . . new petitions filed . . . new actions . . . DXpeditions . . . new products . . . propagation flashes . . Hotline Classified ads . . job opportunities in the ham field . . . hamfest and convention news . . . contest news . . . all those things hams want right now and not the usual two months late magazine schedule. The 73 HOTLINE will be chock full of last minute news since it will be in the mail just a few hours after deadline closing.

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is the 2-slide tuner. It is just a coil of wire with two sliding contacts on it – the picture doesn't show this too clearly but the diagram does. D is the detector, now called simply a diode. C is the bypass capacitor and the two connected circles are the headset – and doesn't it *look* like one!

But if you have a little background experience, the diagram implies even more than it says. The left-hand slider on L is in series with the antenna, and tunes the set. This slider is adjusted first, usually. The right-hand slider is a step-down auto-transformer arrangement to match the diode impedance which is fairly low; this slider peaks up the signal a little. With only a diode and no amplification whatever, the volume is also low, even with a "good" antenna, 60 ft or more, as high as you can get it. Also, a lightning-switch is a prudent part of the antenna system, all implied in A. As against the low level, this crystal receiver had a startling clarity and lack of distortion that largely made up for the rather faint signal. For some applications it remains a practical circuit to this day. You never need batteries for it.

Later, radio magazines began to diagram transmitters backwards, with the antenna on the left just as it is in the receiver diagram in Fig. 2. To trace the signal path from the master oscillator through amplifiers and harmonic generators, you read from right to left. The receivers were still read from left to right, from the antenna to the loudspeaker or headphones. As the brotherhood became more sophisticated and did more signal tracing, they howled about this just before WWII and now all radio diagrams are scanned from left to right, just as you would read a line of printing.

Figure 3 is a simple example of a transmitter. The X is the Piezo crystal that determines the frequency. Oscillations here are amplified in the triode tube and passed on to the tank circuit at the right; this tank comprises a tuning capacitor and a coil. The antenna lead is tapped on the coil for proper loading.

The triode tube shows a grounded cathode, and a plate element at the top, with the control grid between them. A battery and a telegraph key are also shown. Simple as it is, hams have sent thousands of miles with just such transmitters. Now notice one thing – here it is *assumed* that you know that the

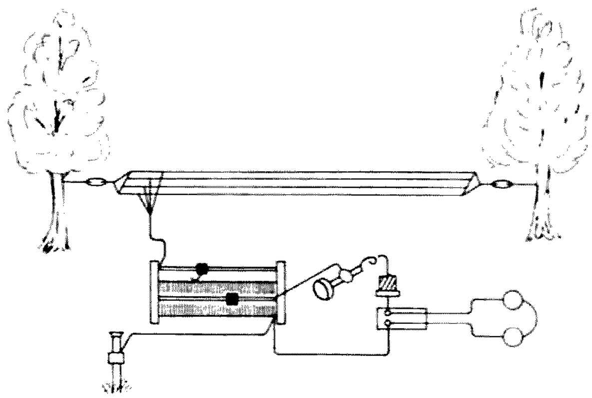

Fig. 1.

cathode must be heated for the tube to operate. The heater circuit, which could be a battery with an on-off switch in one lead is often implied but not shown. The plate circuit plus and minus terminals could be connected to a battery for portable work, but in practice is far more likely to take some kind of power pack: ac supply, transformer with a high-voltage winding, rectifier,

filter, and a low-voltage heater winding for the tube heater. You could use a tetrode or pentode screen-grid tube if you wanted, just by adding a screen voltage supply through a resistor to the plate voltage. The rest of the circuit was essentially the same. I built just such a transmitter in the early 30's.

Figure 4 is a simple receiver. Notice that you still scan it from left to right, just as the signal goes. First the input tuner, then the tube – ah, regenerative, see the little tickler coil in the plate circuit? The regenerative feedback control is that variable capacitor connected from tickler to ground. Hmmm. Makes a very sm-o-o-o-th regeneration control. What's this? A filament-type tube, probably dry-cell operated. The text will say what it is – a 1E4G or a type 30 or 99, probably. Pretty vibration – sensitive, but okay if you don't jar the table. Very quiet and sensitive; no ac hum.

Of course any transmitter operating on any frequency in the same town will overload it, so this circuit is good only in isolated areas. Nowadays it usually doesn't make it as a receiver for serious work.

How could a beginner know all this? A beginner couldn't. But if he actually built either of these circuits, he could tell us many things about them not mentioned here. After he experimented with them a little, he'd no longer be a beginner. When he talked to more experienced hams about his problems, they would no longer have to explain their explanations; the conversation would be enjoyed by both parties.

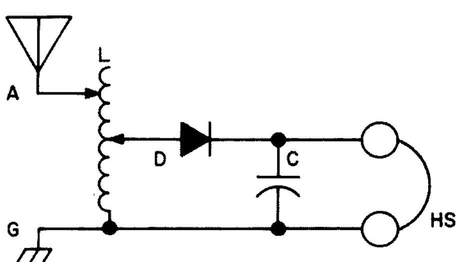

Fig. 2.

It is a curious thing that no one ever pointed out that circuits now follow the signal path, and are drawn from left to right.

Not all of us have visual imaginations, but technicians often do. Take a large complex circuit – a digital computer, a telephone carrier system, transmitter, receiver – and ask the expert a question about something near the beginning of the chain, something else near the middle, and a third thing near the end. The first he will answer before you finish asking. The second takes a pensive stare and a lengthy pause. The third requires time out for a cigarette.

It's actually funny to watch his mind work, because you can easily follow his line of thought if you know the network yourself. He does not necessarily trace the entire path of the signal; he considers groups and sections where this is possible. But in the main he starts at the beginning and follows the signal path at a good clip until he arrives at the point in question, and then, Bang! – your answer. The hesitation is for travel time to the point of interest; once there he can answer a clear question instantly.

Okay, we know that the signal path goes from left to right. But often there are dc potentials to consider, such as plate voltages.

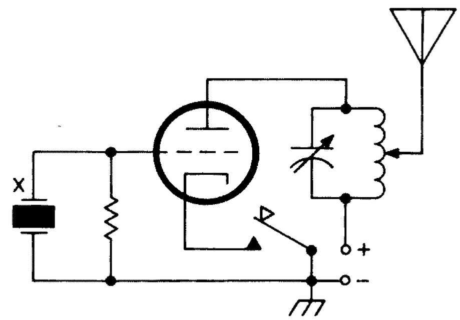

Fig. 3.

Here is another convention that has become a fairly rigid rule, and once again no one has ever mentioned it in print as far as I know. The highest plate voltage is indicated by a bus-bar drawn along the top of the drawing, and this voltage (+250?) drops through the plate load resistance (drawn vertically) to +125V at the plate terminal, down through the tube to maybe +10V at the cathode terminal, and the rest of the way down to zero at the ground bus through the cathode-bias resistor. The whole business is shown more or less vertically. When it isn't, when the plate bus is shown at the bottom with leads going up to the tube, it becomes noticeably more confusing and hard to read.

The vertical potential-concept is particularly helpful in the case of voltage dividers – you just look to see where the voltage tap is, and you know instantly whether it is higher or lower than some other tap.

Figure 5 shows the now-forgotten Loftin-White audio amplifier circuit. It is a direct-coupled, wide-band audio amplifier with a high gain. It did require a power pack with about twice the normal voltage output since the two tubes are essentially in series for dc.

When this circuit first appeared, it was invariably drawn with the big voltage-divider resistances (its main feature) shown horizontally, and many of us built them by-the-numbers without really knowing what we were doing. But see how much more plain and obvious a vertical disposition, such as Fig. 6, makes it! The tetrode (or pentode) at the left has its cathode tapped a little way up on the voltage divider, making it slightly positive for the proper operating grid bias (the grid will be correspondingly negative, class A, low distortion.) The screen grid of the input tube is at much higher potential, around 100V. The plate of the tube 1 is connected directly the the grid terminal of tube 2, the output tube.

This is the whole point; what this circuit is all about. It does away with frequency-limiting coupling condensers (capacitors) and transformers, but places a very high positive voltage from tube 2 grid to ground. If the cathode of the output tube were at ground potential or anywhere near it, the tube life would be measured in seconds. But

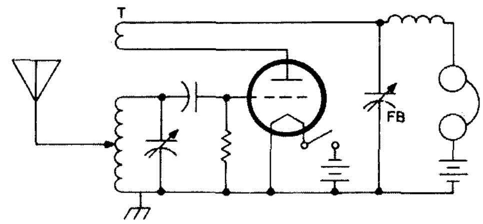

Fig. 4.

it isn't. Instead, *it* is tapped just under the plate/grid voltage tap for the two tubes, so that the cathode is a few volts more negative (less positive) than the plate/grid tap.

Isn't this wrong? It is certainly different from the input tube, number 1. But don't forget the voltage-drop across the plate load resistance of the input tube! This makes the plate/grid voltage actually applied to them somewhat *less* positive than the cathode tap of the output tube, never mind that the latter is tapped further down on the string. This one little point threw a lot of experimenters in the good old days! It would throw some now, but remember that in a voltage-divider you climb up the ladder and the voltage gets higher as you go. You know what dc voltages you need, so work them out.

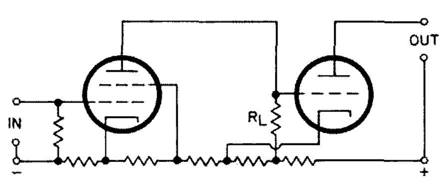

Fig. 5.

Power companies are little interested in circuit theory diagrams, so power diagrams are all but unintelligible to communications men. Their contacts look like capacitors to us, and the wires are a senseless tangle that goes to and from every which-way. But they know the conventions they use, as we do ours, and their diagrams give them the information they want. To each his own, and they can have it!

As the years went by, circuits became ever more complex. At first when we thought of an amplifier, we visualized tubes,

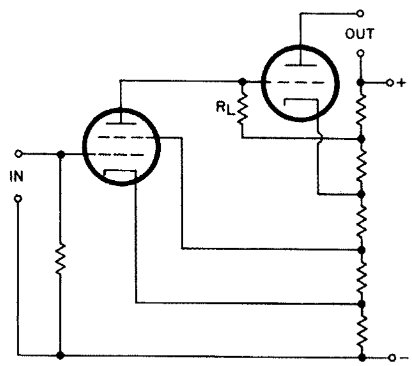

Fig. 6.

coupling transformers, filament rheostats and all the rest of the junk. The modern way is with block diagrams.

Nowdays, an amplifier is not a bunch of things, it is their total, an entity or thing in itself. We draw it as a triangle (to point direction) with the output from the apex. This amplifier (Fig. 7) may have vacuum tubes, transistors, or it may even be an integrated circuit full of microbic (wel' microscopic, then) amplifiers, diodes, stabilizers, and all sorts of esoteric stuff. You just accept it as such and such an amount of gain and let it go at that – there's plenty more to consider without dissecting the amplifier besides. If you want to know how to connect it, or the exact internal working, you look up the IC in the book.

Another great improvement is numbering tube-socket contacts on the diagram, to save you looking the tube type up in the manual and making your own little sketch to help you trace the elements. In the old days all tubes had four prongs, all were surface wired, and the filaments were always the thick pins 1 and 4, the grid was 3 and the plate 2. But Noval tube bases may be connected any way at all, depending on the particular type. So I'm grateful to the character who started numbering tube elements, bless his little heart.

Now let's pick a real dilly – a modern (more or less) transceiver. It has only one tuning control which acts as a variable frequency oscillator (vfo) to tune the receiver and the transmitter to the same frequency simultaneously.

Actually, the receiver is a quite conventional superheterodyne – you know how that works – and the vfo differs from the usual oscillator only in that it is more stable and better calibrated, we hope, than is usually the case. The antenna switch (Fig. 8) rests in the receive position. The rf amplifier in block diagrams is shown as a rectangular block rather than a triangle, because it gives more room for labeling. The rf amplifier goes to the converter or mixer, which also gets some high frequency from the vfo and the mixer output is 455 kHz for the i-f amplifier and so on. Tuning the rf amplifier? Good question – usually it is mechanically ganged with the vfo capacitor in usual fashion, but if the band to be covered is narrow, the rf need not be tuned at all. It is a lot broader than the oscillator tuning in any case.

The transmitter is a little more tricky. The band shown is the 80-meter or 3.5–4.0 MHz, so to mix with this band and produce 455 kHz for the i-f amplifier, the vfo tuning range must be offset 455 kHz one way or the other, i.e., 3.955 to 4.455 – fine for the receiver, but plenty no-good for the transmitter. Because most of this oscillator range is completely out of the band. In the receiver, we subtract the *signal* from the

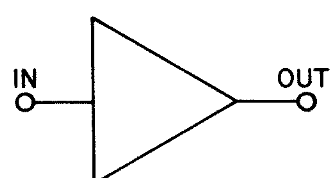

Fig. 7.

oscillator frequency to give 455 kHz which the i-f amplifier will accept. In the transmitter, we *subtract* 455 from the *oscillator* signal to get the proper transmitting frequency band, 3.5–4 MHz.

To make this a bit plainer, suppose you were receiving an AM signal on 3.950 MHz. This would mix with the vfo frequency tuned to 4.405 and the difference frequency, or lower sideband if you like, would be 455 kHz.

When you want to transmit – the vfo, still putting out its tuned 4.405 kHz mixes with 455 in the *transmitting* converter, and

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comes out the difference frequency of – surprise! – 3.950 kHz. This goes through a filter to eliminate other frequencies and harmonics and upper sideband and such like, is amplified, modulated with your voice and connected to the antenna by operation of the antenna switching relay. Thus, the transmitter itself is also a kind of superheterodyne, and in the case of SSB, the similarity between transmitter and receiver is still more striking.

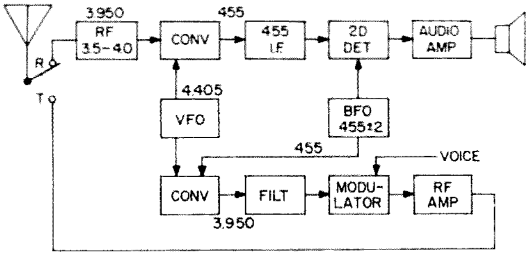


Fig. 8.

The British invented this thing in World War II, and we built one version for them, known as the "Tank Set" because it was used for communication between tanks. It had weird-looking dials with adjustable detents for pretuned settings, which dials had Russian characters on them for the benefit of our Eastern Allies, who used the sets, too. The set had an 807 in the output which loafed along with +350V or so on it. It also had a tank-to-tank high-frequency transmitter and receiver in it, a superregen deal which the hams on this side of the water promptly discarded to make room for the power pack. They discarded it on the other side of the water too – nobody ever said the British aren't good radiomen! The receiver is an excellent one, and is often used in the British Isles as a DX broadcast receiver. It is even used for hamming, where low power suffices.

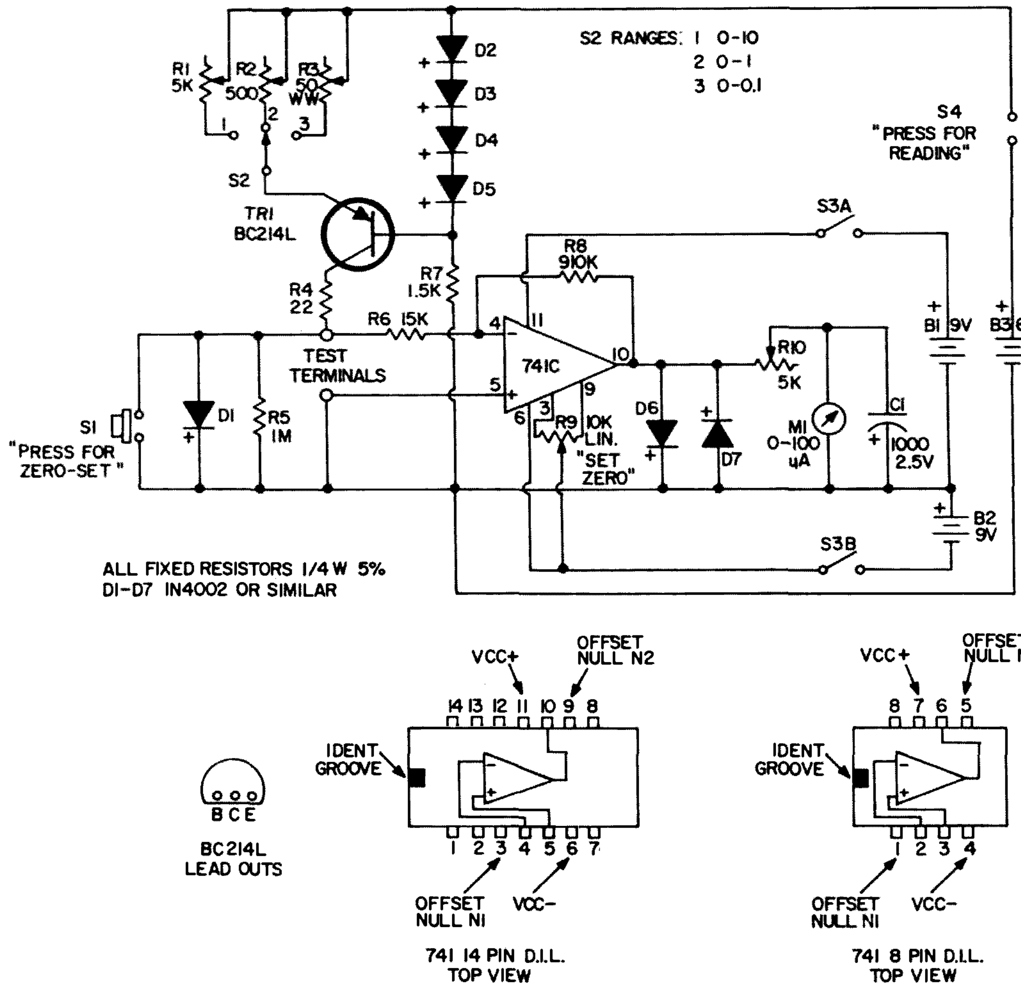
Transistor circuits follow the same lines as tube circuits as regards signal path and dc potentials. They have the benefit of tube experience to build on, and present no special difficulties as far as the diagrams are concerned. If you have a reasonable command of the fundamentals, you should now be able to read a diagram nearly as fluently as a comic strip!

. . .WB2PAP

CIRCUITS, CIRCUITS, CIRCUITS...

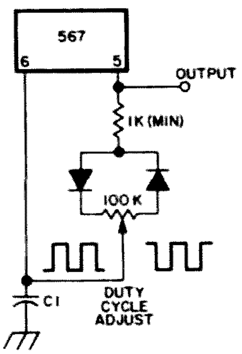
The following circuits have appeared in the referenced books, magazines, application notes, etc. While we try to reproduce all of the information that should be needed by an experienced constructor, readers may want to avail themselves of the original sources for peace of mind.

Readers are requested to pass along any interesting circuits that they discover in sources other than U.S. ham magazines. Circuits should be oriented toward amateur radio and experimentation rather than industrial or computer technology. Submit circuit with all parts values on it, a very brief explanation of the circuit and any additional parts information required, give the source and a note of permission to reprint from the copyright holder, if any, and the reward for a published circuit will be a choice of a 73 book. Send your circuits to 73 Circuits Page, 73 Magazine, Peterborough NH 03458.



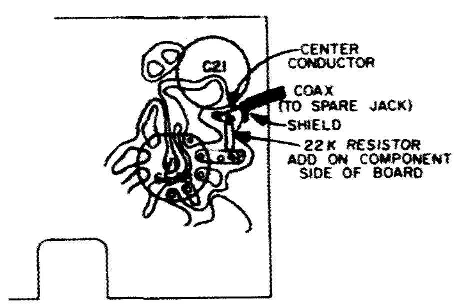
Full circuit diagram for the ohmmeter. It is capable of measuring resistance down to less than 001Ω. The two circuit points marked 'A' are wired directly together.

PULSE GENERATOR



Courtesy of Signetics Catalog

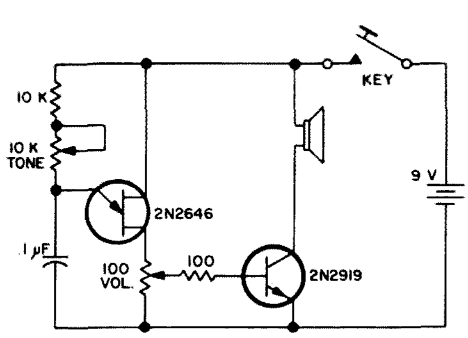
PATCHWORK FOR THE HW-101



MODULATOR CIRCUIT BOARD (Foil Side)

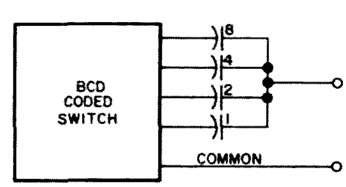
CB Channel Assignments

Channel Number	Frequency (MHz)	USE
1	26.965	Voice, same licensee only
2	26.975	As above
3	26.985	As above
Brown (24)	26.995	R/C & walkie-talkies
4	27.005	Voice, same licensee only
5	27.015	As above
6	27.025	As above
7	27.035	As above
Red (25)	27.045	R/C & walkie-talkies
8	27.055	Voice, same licensee only
9	27.065	Emergency use only
10	27.075	Voice, any CB licensee
11	27.085	As above
Orange (26)	27.095	R/C & walkie-talkies
12	27.105	Voice, any CB licensee
13	27.115	As above
14	27.125	As above
15	27.135	As above
Yellow (27)	27.145	R/C & walkie-talkies
16	27.155	Voice, same licensee only
17	27.165	As above
18	27.175	As above
19	27.185	As above
Green (28)	27.195	R/C & walkie-talkies
20	27.205	Voice, same licensee only
21	27.215	As above
22	27.225	As above
A	27.235	Business Radio Only (HELP?)
B	27.245	As above
23, Blue (C)	27.255	Voice, any CB license, also R/C & walkie-talkies, also Business Radio
D	27.265	Business Radio Only
E	27.272	As above



CODE PRACTICE OSCILLATOR

Here is a code practice oscillator with variable tone and volume. Thanks to WB9IDI for this circuit.



SIMPLE DECADE CAPACITANCE

Using a BCD coded switch capacitor in parallel can be switched in or out. Thus by using 4 capacitors any valve from 1 to 16 can be obtained, however since most BCD switches are from 0 to 10 a decade is obtained. Capacitors used are in the relation 1, 2, 4, 8 with the proper multiplier 1µf, 2µf, 4µf, 8µf. Keep all leads as short as possible. Thanks to L. S. Naguiney WA3GBC/1, for this circuit.

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RT-857/ARC-134 . . . RT-859/APX-72 .
RT-524/VRC . . . RT-246/VRC . . . .
R-442/VRC . . . R-390A/URR . . .
RT-648/ARC-94 . . . AN/TRC-68 . . . . .
AN/VRC-24 . . . AN/URC-9 . . .
CU-1669/AR . . . 490T-1 . . . 618T-1-2-3
C-6287/ARC-51BX . . . AN/PRC-25 . . .
AN/PRC-77 . . . Wilcox 807**

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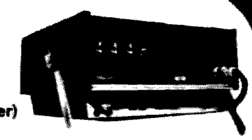
T. R. I.

Frequency Counter 1 KHz-60 MHz



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Reg. $299 *See Nov. '72 CQ & April '73 QST Reviews*

A frequency counter with a range of 1 kHz to 60 MHz (or 130–160 MHz when used with our TRI–160 converter). With a resolution of 1 kHz or 1 Hz (at 1 ms. or 1 s. gate times). It can be operated on either AC or DC, with complete overload protection. Plus a stability aging rate of 1 part in 10^6/week. And the whole unit is a mere 7" deep by 2½" high! Superb laboratory precision quality at LESS THAN KIT PRICES. Call or write for literature and trade in or our *LOW INTRODUCTORY PRICE*.

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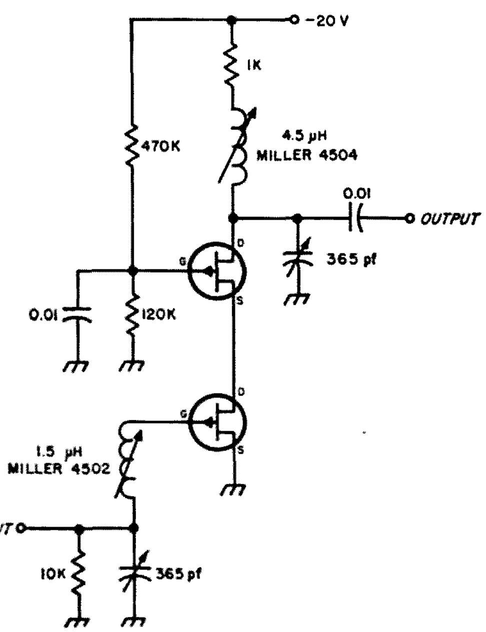
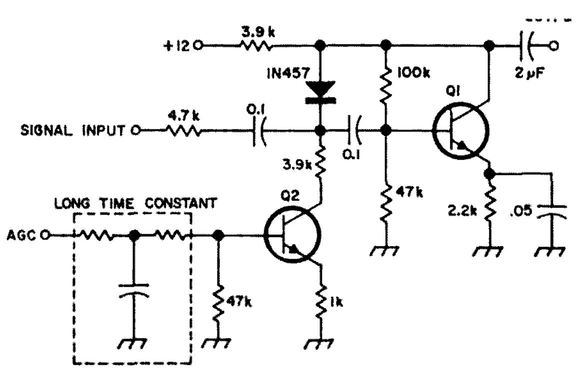
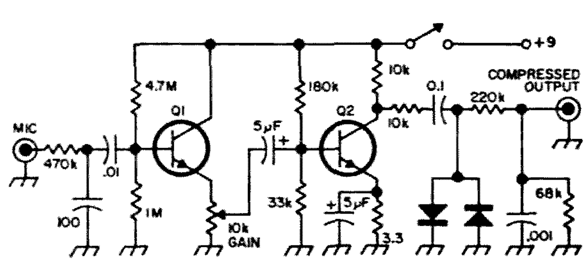
MORE CIRCUITS . . .



This 30 MHz if stage uses two FET's connected in the cascode arrangement to provide 20 dB gain without neutralization; the bandwidth is 4 MHz. Both FET's in this circuit are 2N3819, MPF105 or TIS34. With a negative supply voltage, the 2N4360 or TIM12 would be suitable.

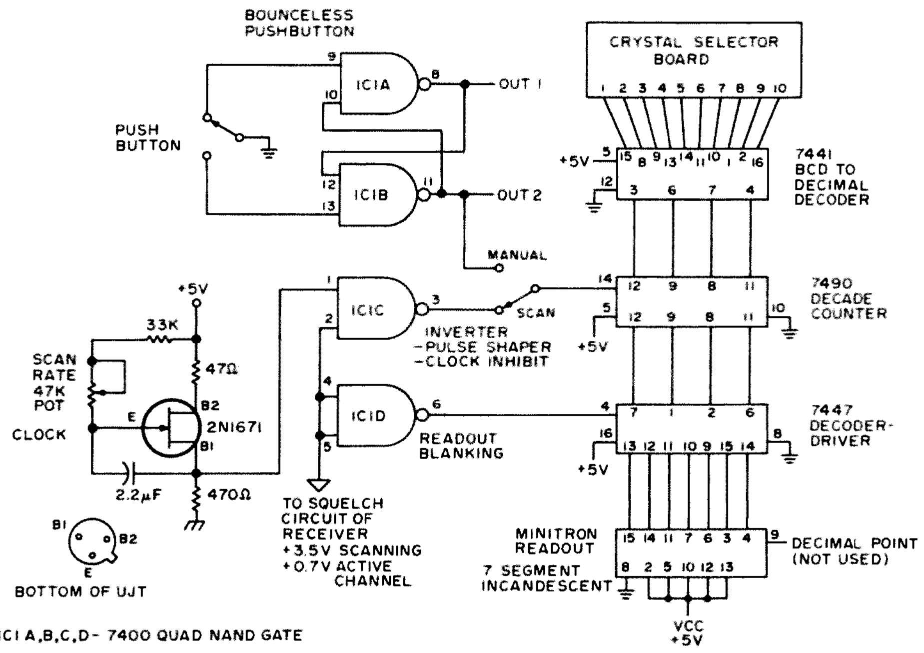


This super AGC circuit only requires two transistors to obtain up to 60 dB of control. Q1 and Q2 are 2N1613 or HEP-254.



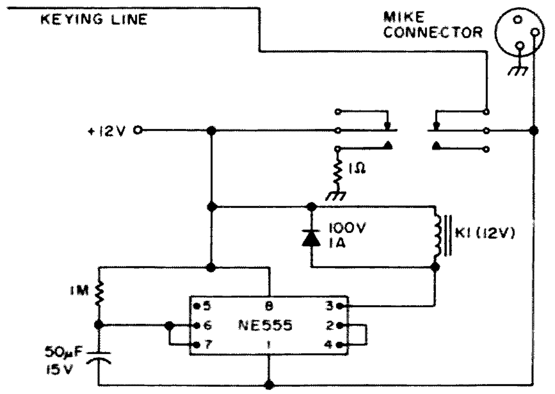
Two stage clipper/preamp will increase the talk power of your rig. Transistors Q1 and Q2 are 2N1304, 2N2926, 2N3391, SK3011, or HEP 54. The diodes are IN456 or HEP-158.

INTEGRATED CIRCUIT CHANNEL SCANNER



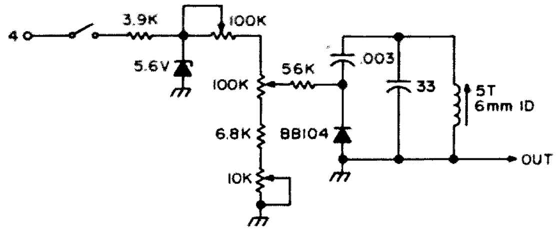
This unit is capable of scanning a series of channels in a receiver by switching crystals in and out of the first oscillator. It works like this. A UJT is used as a clock to produce a series of pulses. This particular UJT is fairly expensive ($2-$4) but it operates well on 5V. The pulses are of the wrong polarity and quite noisy. To correct both situations, they are fed into one gate of a quad two-input NAND gate, a 7400. The output of this gate is connected through a switch and thence to the counter. Note: Bypass 5V supply frequently .01-.1μF. Thank you George Cserenyi and Brian Hyndman VE7BHY.

ANTI-TIMEOUT TIMEOUT TIMER

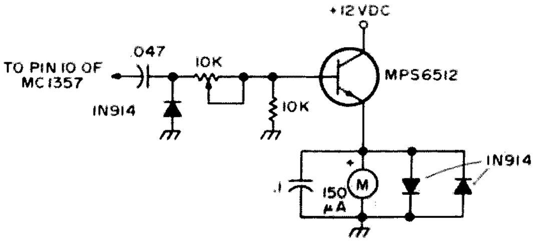


This circuit is designed to timeout your rig before it times out the repeater. It uses a simple 1 minute 59 second timer. It is shown wired for a TR22 but can easily be modified to work with any rig. Total cost about $5. From the 31/91 KaChunker.

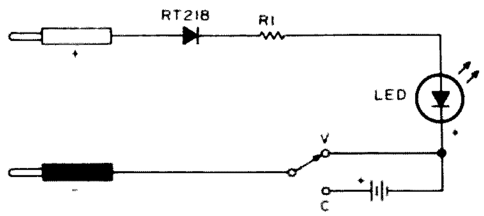
12 MHz VFO FOR A TR22



S-METER FOR REGENCY

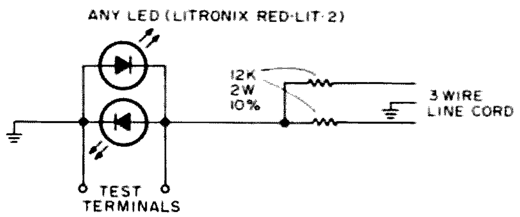


LED VOLTAGE AND CONTINUITY TESTER



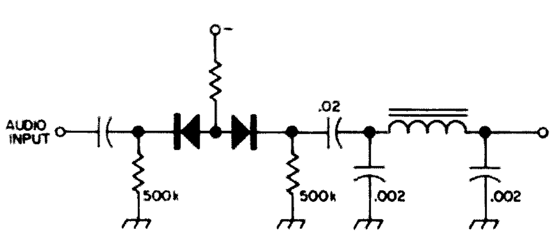
This tester will tell you polarity (+ or -, 6V or 12V). It will check for presence of dc at any terminal or connector and it will test the continuity of a bulb, fuse, cable or wire. When the switch is in the "V" position you can check for voltage polarity and presence of voltage. The ED150 will light only if the positive (red) test lead is connected to the positive voltage source and the negative (black) lead is connected to the negative terminal. It will work only if there is more than 3V present, and will be ruined at 15V. In the "C" position a 9V battery is added to the circuit. The ED150 will light when the test leads are connected to anything that will carry current provided that the "anything" is electrically OK. Parts needed are: R1 = 470Ω, ¼W, LED = Sprague ED 150 (or 155), diode = RT218, 9V battery, SPDT switch, miniature box, grommets, battery connector, two 3-terminal strips. Thanks from the Sprague Products Co., No. Adams MA 01247.

SUPER SIMPLE DIODE CHECKER



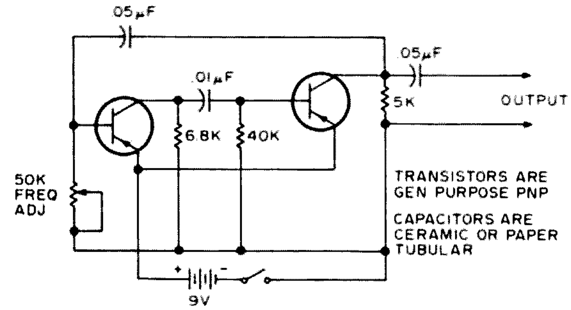
Thanks Noel Calvin, 2683 Buena Vista Way, Berkley CA 94708.

AM or FM CLIPPER



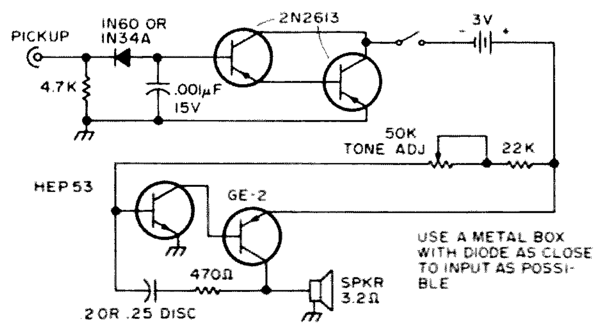
A good clipper for AM or FM use includes adjustable clipping level and a harmonic filter.

SIGNAL INJECTOR

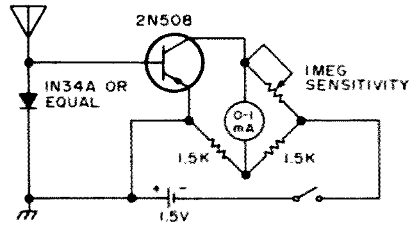


Thanks Steve Uhrig WA3SWS.

WIRELESS CW MONITOR

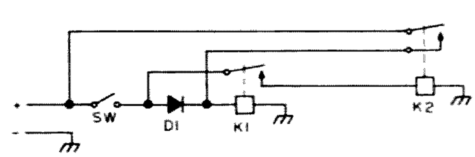


FIELD STRENGTH METER



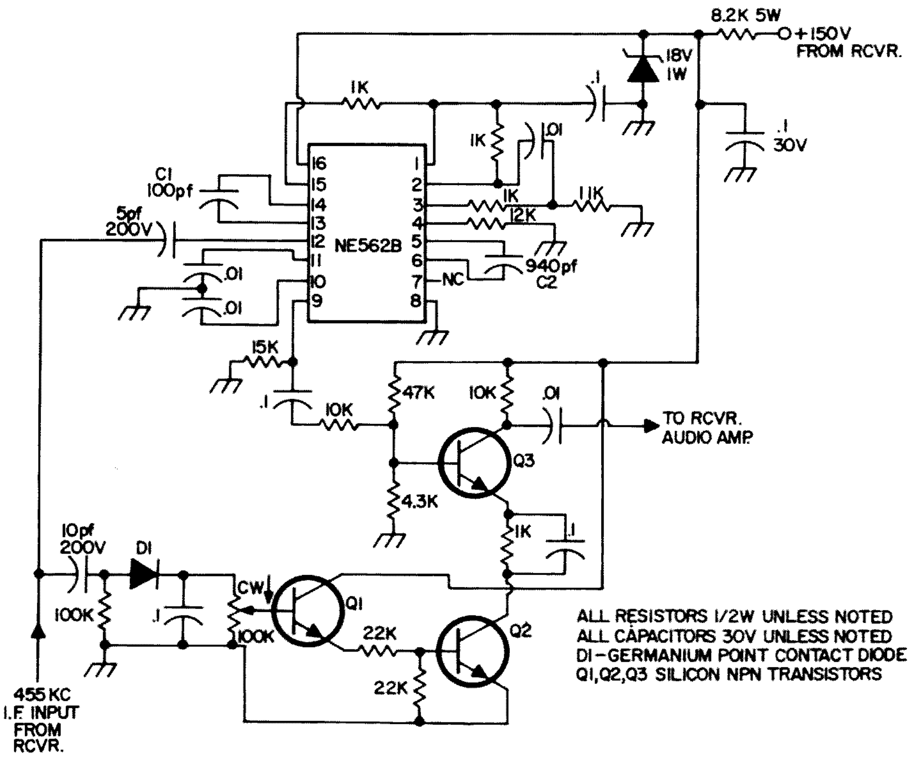
Thanks Steve Uhrig WA3SWS.

VOLTAGE CONTROLLER

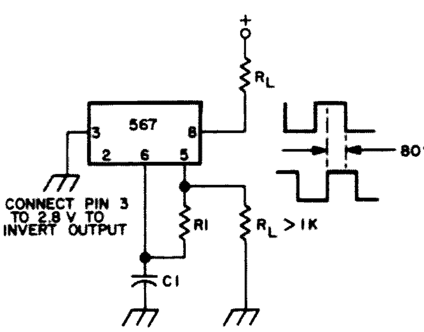


K1 on first and off last. K2 on last and off first. Handy for Pentode or Tetrode power amplifiers where K1 controls plate volts and K2 controls screen volts — overload dekeying, etc. Thanks W8UFN.

CIRCUITS, CIRCUITS, CIRCUITS...

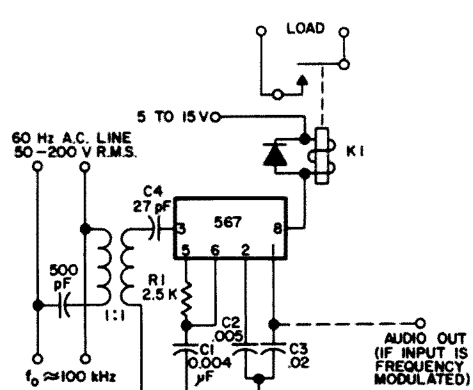


OSCILLATOR WITH QUADRATURE OUTPUT



Courtesy of Signetics Catalogue.

CARRIER CURRENT REMOTE CONTROL or INTERCOM



Courtesy of Signetics Catalogue.

. . . Staff

Schematic Of The Month

WILSON 2m FM Transceiver

The basic circuit of the Wilson transceiver has evolved from the Ken unit a year ago to the Henry Tempo FMH – and now it is the Wilson. But there are changes – substantial changes – and all for the better. The Ken was a lot of transceiver for its price, but some amateurs wanted a hotter receiver and wanted a little more poop in the output. The Wilson has a new front end and it is a hot one. It also has a better rear end for more poop on transmit.

There are some other benefits to this rig when compared with other HT's on the market – things like the netting capacitors on all of the crystals, both transmit and recieve. This makes it a lot easier to get the unit right on channel. And all of the crystals are plugged in too, not just some. The earlier Ken units had two channels soldered in – which was not serious where you had a use for both 34/94 and 94/94 – but these days, with no 34/94 repeater in New York, Chicago, Washington, Boston, Los Angeles, etc., that turned out to be a rather serious wasted channel. And in the 34/94 areas, the 94/94 pair wasn't all that valuable. Better that all crystals can be plugged in as in the Wilson. The fact is that a five channel HT with two soldered in channels is a three channel radio.

The Wilson has six channels – and that is none too many in most areas. It is none too few either, for seldom are you inan area where you can reach more than six repeaters with an HT. Considering the size of the HT – and there is more than a little resistance to the larger HT's such as the Unimetrix – more than six channels would begin to crowd things inside so the unit would have to be bigger. You want a unit that is comfortable to hold in the hand – that will fit in the pocket – or on the belt.

Speaking of holding in the hand – one of the really annoying things about most HT's is that if you have any kind of noise level you have to hold the speaker up to your ear and then quickly swing the HT down to speak in the loudspeaker when it is your time to transmit. This little maneuver usually takes longer than the time between transmissions on the repeater, so you are aced out. With some ops you have to be mighty fast of finger to break in and that part of a second it takes you to swing the HT from your ear to your mouth you'll lose out. The Wilson has thymike mounted toward the bottom of the unit, right where your mouth comes when you put the speaker to your ear.

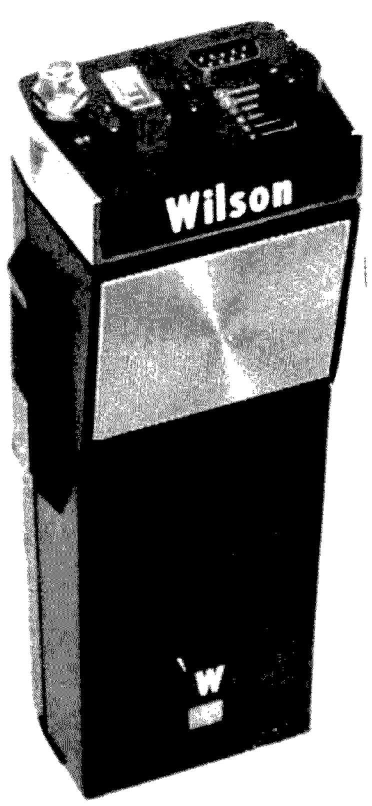
The use of the separate mike (such as you'll find on the late Motorola HT's) results in considerably better audio. You'll find that reports are most gratifying on your audio.

Another big hassle with the Motorola units are those incredibly expensive nicad battery packs they use. The Wilson uses those low cost AA size nicads (you can put in regular AA flashlight batteries in an emergency) – these batteries sell at every Radio Shack or Lafayette store for peanuts – or you can even catch someone like Hal Babylon (advertised in 73) with surplus nicads for a fraction of the Radio Shack price!

When you use your HT on your belt – for instance at hamfests – you want a remot mike that plus into the unit. The Wilson has a plug for this – and it also feeds out the audio fro the loudspeaker which you can hear from a small speaker which is mounted right in the mike case!

The S-meter is handy when you are in a weak signal area and want to peak up a repeater in order to be sure to get the best signal back into it. It doubles as a battery indicator so you won't run your nicads down too far and reverse them. Nicads don't like that.

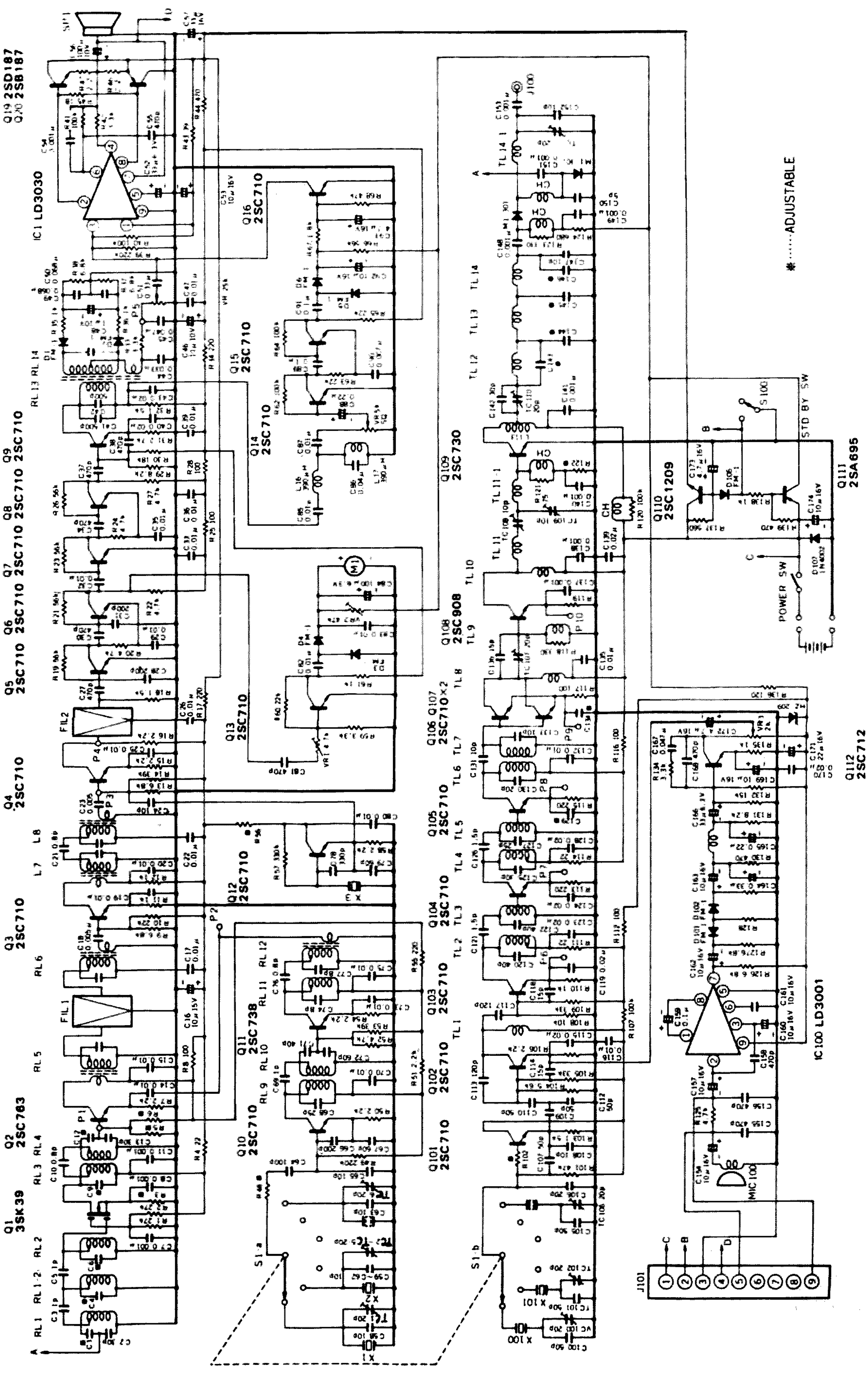
The circuit board for the Wilson is the size of the case – and this means that everything is easy to get at for servicing. If you've ever tried to fix a Motorola HT-220 you will appreciate the room in the Wilson for work – and the use of small, but not invisible parts.



One problem with the earlier Ken units was a weakness of the internal molded track for the battery pack – it often broke when the HT was dropped – and who doesn't drop one now and then? The Wilson may break if you try hard enough, but it will take an incredible beating before giving up.

Obviously the Wilson is quite a rig – and one would expect it to come through at around $280 or so. Wilson is selling them for only $199 for reasons best known to themselves. It would seem prudent to get one of these radios before the folks at Wilson wise up.

. . .STAFF



Q19 2SD187
Q20 2SB187
IC1 LD3030
Q16 2SC710
Q15 2SC710
Q14 2SC710
Q13 2SC710
Q12 2SC710
Q11 2SC738
Q10 2SC710
Q9 2SC710
Q8 2SC710
Q7 2SC710
Q6 2SC710
Q5 2SC710
Q4 2SC710
Q3 2SC710
Q2 2SC763
Q1 3SK39
Q101 2SC710
Q102 2SC710
Q103 2SC710
Q104 2SC710
Q105 2SC710
Q106 Q107 2SC710×2
Q108 2SC908
Q109 2SC730
Q110 2SC1209
Q111 2SA695
Q112 2SC712
IC100 LD3001
FIL1
FIL2
S1-a
S1-b
S100
STD BY SW
POWER SW
MIC 100
J100
J101
* ......ADJUSTABLE

(W2NSD/1 cont. from p. 3)

Form 1 would require the applicant to write out his name and address. Form 2 would require him to sign a promise to learn the code someday. The license would permit him to use all ham bands with all modes – no subbands.

This system would have some benefits. The current trend toward extinction of amateur radio via a 3-½% drop per year would certainly be reversed. It is possible that it might be substantially reversed and that the growth might be sufficient to attract the interest of manufacturers big enough to help us get more bands and widen our present bands. One million amateurs pressuring congress could work wonders, particularly with a well funded EIA amateur division pouring money into the right pockets in the appropriate government agencies. With power like that we might look forward to grabbing off some of the lesser used UHF television channels. It is difficult not to see what has happened with CB, where totally illegal activity is enthusiastically supported by industry and permitted to go virtually unrestrained by the FCC, all because there are millions of dollars involved.

There are a few drawbacks to be considered. I suspect that we would see a lot of the W2OY syndrome – remember his calling CQ first class only, no lids, no space cadets, no ten meter ops? The CBers have an answer for this, too, as they have demonstrated recently when a woman complained to the FCC about CB interference. They got together and killed her dog, threw a brick through a window, and called her on the phone and threatened her with rape and mutilation. When this didn't stop her, they went to beating her up on a bus, stealing her car and smashing it, hitting her in the face with a brick when she opened the door to get a telegram, and ten or more obscene phone calls a day, plus threats on her life. They sent her all sorts of merchandise collect – sent plumbers, electricians, ambulances, taxis and fire trucks. There *are* ways to keep CB complaints down.

PRESENT STRUCTURE

Usual Entry
5 wpm code test
General/Tech exam
Tech Class License
or
Usual Entry
5 wpm code test
Novice exam
Novice Class License
13 wpm code test
General exam
General Class License
Advanced exam
Advanced Class License
20 wpm code test
Extra exam
Extra Class License

Since 95% of the amateurs never get to the end of the line, it would appear that the system leaves something to be desired. It is anyone's guess as to what the results would be if the system were changed. Predictions of the future have always been chancy at best, so we should take claims that certain changes in structure would be disasterous or would be greatly beneficial with a truckload of salt.

It does seem as if we should try for some system which would result in more amateurs achieving the top license. My own suggestions on this in the past have been almost totally ignored – I felt that incentives should be offered – while others, who were able to win out, felt that punishment was a better method of forcing compliance. The carrot or the stick choice. My ideas might not have worked either, of course, so perhaps I can't be as smug as I might be about the ARRL plan failing so totally.

THE CQ PLAN

Entry
Novice exam
Communicator Class License
5 wpm code test
Novice Class License
General exam
Technician Class License
13 wpm code test
General Class License
Advanced exam
Advanced Class License
Extra exam
Extra Phone Class License
20 wpm code test
Extra CW Class License

This has seven different classes of license, presumably with seven different sub band allocations. It is not clear why more Techs would go on to General than do now, so that may be misleading chartwise and in practice the Tech ticket would remain the dead end street it is today. This means that there are just two basic changes to the present structure – the communicator license – this would seem to be the same thing I proposed as a Hobby Class license for 220 use, though I have some reservations about the scheme – and the separate Extra Phone and Extra CW licenses which I also petitioned the FCC for some years ago. It didn't make sense to me to have a 20 wpm code test to operate phone – and there seems to be general agreement about this. I do appreciate CQ adopting my petitions and pushing them as the new CQ plan.

THREE LEVEL LICENSE SYSTEM

One plan that is attractive to the FCC because it is simpler than the six and seven level license schemes is the three level idea which would have a beginner, an intermediate and an expert level. This is a bit closer to the system used back in the 30's and 40's where there was the Class A with all privileges, the Class B with fewer privileges, and the Bootlegger with no official privileges. The Bootlegger Class had the advantage of no exams, the call of your choice, and the use of all bands – obviously a forerunner of the current CB operating system. For those readers who have had their sense of humor amputated or attrophied, the preceding was not seriously presented.

Entry
Novice exam
Learner Class License
Endorsement by licensed amateur for code
Learner Class License with CW privileges
13 wpm code test
General exam
Intermediate Class License
Advanced/Extra exam
Expert Class License

This obviously isn't a lot different from our present system either. It would lump the Tech and Novice together and either the Advanced and the Extra or the General and Advanced. They might keep the Extra Class separate and let it die a natural death, rather than demote Extras back to Advanced.

Since I have a petition in already asking that Techs be granted Novice privileges, and another asking that there be an Extra Phone License without that 20 wpm test, this structure is very close to what would emerge if my petitions were granted.

OTHER RESTRUCTURING IDEAS

The FCC is up against a lot of decisions in restructuring – such as what emissions to allow each class of license – what frequencies – what transmitter power – eligibility for the various station licenses – station call sign format – call sign prefixes – honorariums for old timers – volunteer examiner eligibility – length of license terms – etc.

For instance, there is considerable thought being given to a substantial change in power limits. If the three level system were to be used and a power differentiation of six dB between powers, this might allow the Learner to use 125 watts, the Inter-

mediate 500 watts and the Expert 2000 watts output. Yep, that's output, not dc input or PEP input. Our 1 kW limit has been around for a long time and it may be time to take a closer look at it.

In my travels I have found that there are definite advantages to running high power, no matter how avid the QRPers may be. When you operate from YA, VU, 9N and other remote areas like that you hear the high power boys almost nightly – the medium power boys a few times a month – and the low power boys a few times a year. The lack of a substantial number of high power signals invites commercial invasion of our bands.

Time was when a kilowatt was so prohibitively expensive that only the most wealthy amateurs could afford to build one. Now you can tuck a kilowatt into a car – almost under the dash! It used to take racks (six feet each) of equipment for a rig like that, and now you can carry it around and set it on the table. CBers have shown us that 3000 watt transmitters are not all that expensive to buy or use. Shouldn't we be able to work out as well as CBers?

The FCC is about ready to throw out all previous restrictions on call signs and are thinking in terms of things like W1A for some club stations – which would be a 1x1 call. They would keep the present 1x2 (W1AW) and 1x3 (W2NSD). Add to that possible 2x1 such as WA1A and 2x2 like WA2AA, plus the current 2x3 calls. This would give some nice privileges for incentives. They are also thinking in terms of more prefixes, and the U.S. has many we haven't been using. They might open up the AA-AL, KA-KZ, NA-NZ and WA-WZ. What turns you on?

With such a wide selection of call signs available the FCC could set up their computer to give you the call of your choice. How about that?

There is much, much more to be said on restructuring, so let's think about it and we'll have more next month. In the meanwhile, if you come up with any ideas that seem inspired, why not send them in for exposure in 73?

FCC VS NETS

The complaints of some of the amateur nets – in particular the Wescars net – complete with pressures via Congress – about interference from jammers has the FCC seriously concerned. Wescars and the jammers have their own version of the mideast conflict.

There is no question that some of our nets do serve very valuable purposes, at least some of the time. They do tend to give us better use of our frequencies since they keep large numbers of stations all on one single channel instead of spread out all up and down the band. Other nets are for fun.

While there are undoubtedly amateurs with severe psychological problems who are just looking for people having fun that they can spoil and who delight in clobbering a net, many of the problems encountered by nets have more to do with the way the net gets started on a channel. Few amateurs take well to the flat demand that they get off a frequency because it is the net's and the net is going to start in a few minutes. I will never forget the day I was operating from PJ3CC, happily working fellows around the states, when a woman came on channel and told me to get off the channel – that I had no right to be there – this was the YL International SSB Net frequency and the net was about to start and I certainly was a trouble maker for even daring to use the channel. Wow!

Amateurs who feel that the interference to a net is serious enough to warrant a complaint to the FCC should keep in mind that there is a petition on file now by K6BX to officially license and regulate all nets. Every complainer should be sentenced to read this petition – he would never complain again.

The FCC position is that first of all the regulations prohibit deliberate interference. This is probably one of the least heeded rules on the books – every DX pileup is testimony that dozens to hundreds of amateurs are intentionally interfering with each other – but maybe pileups don't count? Frequencies are supposed to be available on a first-come first-served basis – and this is supposed to include nets, even if they are registered with the ARRL and are thus "official" nets, whatever that means. The FCC feels that it is up to amateurs to work out a solution to the net problem – or else they will do it. And all we have to do is remember the recent "solution" to the repeater problem to know that the chances are good that the very worst solution to the problem is FCC action.

If the FCC continues to get complaints about or from nets, it is quite possible that some system of net licensing, with one to two year delays, license fees, and allocated channels and times, with the usual delays in changes in times or channels, might be established. This prospect – and again I suggest you get a copy of the K6BX petition and read the complete thing (I think copies of it can be had for $20 each or perhaps a bit less). This prospect should help nets do some self-examing to see if there isn't some way to solve their problems with public relations – better techniques of getting the net started, etc.

There is a lot to be said for leaving the FCC alone. Remember, when you feel that there is something you want to do that is not specifically permitted that the FCC works on the other side of the coin – if it is not prohibited, then it obviously is permitted. The basic rule when dealing with the FCC – and all government – is, when in question, don't ask.

NEW FCC EXAMS COMING

The Commission has been working on an update of all of the amateur radio exams and it is being helped in this by some amateurs who are expert in the fields to be covered by the exams.

The material to be covered in the exams has been broken down to the following categories:

1. Rules and regulations
2. Radio phenomena
3. Operating procedures
4. Emission characteristics
5. Electrical principles
6. Practical circuits
7. Circuit components
8. Antennas and transmission lines
9. Radio & communication practices

It will be a while before the new exams are ready for use. The study material will not be substantially different from that which appears in the 73 license study series. The main changes that the new exams and study material will bring about will be a complete revising of the ARRL license study manual, which will be made obsolete. Some feel that it is just about irrelevant right now, but it does sell well and is responsible for helping thousands of prospective amateurs to pass the present license exams – and helping thousands of others to fail.

The 73 Magazine license study guides have been broken down pretty much as the FCC has done it, with each chapter covering a technical aspect of radio in depth and not, as the ARRL manual does, just giving questions and answers. The benefit of this in depth study system has been proven lately by the high percentage of successes of amateurs using the 73 system on the Conditional exam, which is a lot tougher than the FCC administered General exam now.

The recent FCC figures show that about 50% of those taking the Conditional exam are passing it as compared to 75% passing the General exam! What is the difference between them? Well, they cover about the same

material, but the General exam is the usual multiple choice exam with five statements, four of them wrong, and you have to pick out the correct answer. On the Conditional there are four right answers and one wrong – you pick out the wrong. It's a lot harder.

STRIKE

A strike of most of the unions at the printers of 73 Magazine delayed the mailing of the June issue by about ten days. This issue (July) might possibly have been delayed too. If so, then we apologize for a situation beyond our control.

WOODEN CIRCUIT BOARDS

A recent phone call from K3CMZ, who builds a lot of stuff but doesn't write much, explained some short cuts he has developed which may be of interest. For instance, he uses some of that thin balsawood for mounting ICs – you carefully shove the IC pins through the wood and you're in business. The balsawood makes a light servicable chassis. He makes little boxes for gadgets out of those brass strips they sell in hobby shops (where he went for the balsawood). The strips come to an inch wide and are 12" long, cost 25¢. He cuts these up and solders them to make small brass boxes. A small strip of hard wood along each side of a box, routed out to slide the balsawood chassis in, and you can stack up a number of the little chassis in one box.

VISITING BOSTON?

FM'ers visiting Boston may wonder which are the best repeaters to be ready to use. There are a couple of dozen repeaters in and around the Boston vicinity, but not all of them are close enough for low powered rigs, and a few are not friendly to visitors sad to say.

For starters you should be ready for 146.04-64, the Waltham group. This is the busiest repeater in greater Boston, and one of the most friendly (when you can get through to it). If you're toward the north end of town, from Route 128 on out, you'll do well to be set for 146.25-85, the Derry New Hampshire club. You won't find a more friendly group anywhere in the country. If you prefer a more businesslike and get off the pot machine, one which handles a lot of patches, you'll want 146.22-82 in Weston, one of the vast complex of MMRA repeaters.

If you have the weird crystals or a Clegg 27B, you'll be able to say hello on one of the most sophisticated repeaters in the area on 146.39-99. This is W1UQ, a closed repeater, but peopled by friendly and interesting ops.

A new repeater in Malden is on 146.19-79. You may get in a contact or two on it if you can get K1VTE to stop playing with his autopatch. In the same town you can also use WR1AAA 146.31-91. This is a strictly local repeater and will take you from downtown Boston out to about Route 128 (the highway which circles Boston. Say hello to Mel W1BHD.

Up on the north shore is WR1AAC on 146.28-88. It is also a local repeater and not too strong even in Boston. Out in Billerica at the Honeywell plant is WR1ABP on 147.72-12. It isn't as active as a lot of the others, and watch out for a zing from Lew, but there are a lot of first rate fellows that do hang out there. The 147.84-24 repeater covers that northern area pretty well too, but they generally don't seem to like visitors and have been known to turn off the repeater if you try to call in.

Off to the west of town you'll run into a repeater on 146.01-61 – not too active, but a nice group. There is also one on the ridiculous pair of 147.87-03, but it is kind of closed, and very inactive. If you can get them to talk with you, the fellows are fun to meet. Ask them about W1PRI and then stand back for the blast! It's almost worth the trouble of waking them up. If you have crystals for 146.07-67 you can exercise them out that way too. Out Worcester way you can call in on 146.37-97 and say hello to Charlie. Same pair works north out of Salem (NH), but not used a lot. Very nice guys when they are available. Also to the west is DL2AA/WR1, the only reciprocal licensed repeater.

That should hold you in and around Boston.

REPEATER WARS

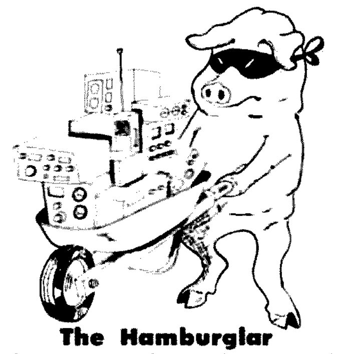
The FCC has been quite outspoken on one point: if we cannot solve our own problems they will try to solve them for us. I think we have all had far more than we need of FCC solutions to ham problems and from the exciting experiences we have had we should learn that it is time to stop turning to the Great White Father for help whenever we get into trouble – and realize that we must work out our own problems.

Repeater wars are problems and they need solutions – better solutions than higher and higher power – deliberate interference – kerchunking – and the usual silliness. I remember the reaction of a repeater owner in Holyoke MA, when Ken Sessions first put a repeater on 34/94 up here in New Hampshire – RTTY on the input by the hour. War. Not a visit to see what could be done to solve the problem.

With difficulty I will restrain myself from giving specifics, using a certain cretin in Connecticut as a horrible example of the war-prone repeater op.

In most areas we have an excellent start toward peace with the organization of repeater councils and frequency coordinating groups. But that is just the first step. One thing that became very clear during the FM forum at Dayton was that there is a serious need for some way to get repeater councils together to solve intermural problems. Whether this will turn out to be a national council meeting or a council newsletter remains to be seen. Communications is badly needed at this level.

W2NSD



The Hamburglar

STRIKES AGAIN!

List from Past Issues: Mfr., Model, Ser. No.	Owner	Issue
AF68 No. 10888	K5LKL	1/73
PMR8 No. 10918		
M1070 pwr supply		
Trio TR2200 No. 241969	WA2ZBV	1/73
Clegg 22er No. 1900-578	W1DHP	2/73
Standard 826M, No. 112007	WA8PCG	3/73
FM27B No. 27013-1141	W2LNI	4/73
FM-144-10L No. F459	WA6WOA	4/73
NPC 107m pwr supply		
2, 5AJ-IPL Onan Gen.,		
No. 327885		
HR-2 No. 04-C2879	W6GSR	6/73
SB-34 No. 21 1828		
STD 826 No. 011268	WA2FSD	6/73
HT220 No. GJ7327	State Univ. of NY (Albany)	6/73
Yaesu FT-101	W4GF	7/73
No. 82G 12279/CW		
HR-2 No. 0302030		
Clegg 27B No. 72013-1068	W3BXL	7/73
STD. 826 MA No. 208078	WB2DEW	7/73
Drake ML-2 No. 10582	W3MSN	8/73
Sonar FR-2528 No. 21-4250	Doherty	12/73
STD SRC-851-SH		
No. 9725		
STD SRC-707C		
No. 2833		
TPL PA-6-IDE No. 1092		
RP MEA-22 No. 212		
Two Larsen antennas		
Swan 270 No. M-252616	W4NTB	12/73
STD SRC-146A		
No. 208070	W7DKB	12/73
Marker Luxury	W7BVP/6	2/74
No. 2296		
Regency HR-2A 2m FM	WB8NSU	3/74
No. 04-05632		
Collins Model KWM-2	W9JS	3/74
No. 13551		
Regency HR-2A	WA3TVI	4/74
No. 04 0787		
Kenwood TS-520	W7JFR	5/74
No. 840092		
CW-520/511S filter		
Inoue EC-20 No. 1161	W1PVF	7/74
1-RF Communications		
RF-403-2 VHF-FM XCUR		
No. 1277	K3YHR	7/74
Sonar 3601 No. 1416	K1UXD	7/74
SBE Model SB-144		
No. 46316 $25 reward		
$25 for information for		
arrest and conviction of		
thief	K4KVF/5	7/74
Clegg 27B No. 27103-2891	WA1ECF	7/74

Caveat Emptor?

Price – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months *prior* to *publication*. For *example*: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

GREATEST of them all! That's the ARRL 1974 National Convention, sponsored by Hudson Amateur Radio Council. Remember the dates – July 19, 20, 21 at the Waldorf-Astoria, New York City. Three days of exciting events! Wide array of demonstrations, exhibits and forums featuring latest in FM, SSTV, ATV, RTTY, FAX, Satellites, Antenna design, Transistors, Integrated Circuits, DX, MARS, ARPSC and much more. Something to do every exciting minute for YLs & XYLs – Tours, New York sightseeing, visits to popular TV shows, Parties, Fashion Shows. Meet the ARRL President, Vice-presidents, and all 16 Directors! Famous-name Speakers at Saturday Night Banquet! Everything for the Non-Ham, New Ham and Old Timer. For info, Contact: ARRL Convention, 303 Tenafly Road, Englewood NJ 07631.

DANVILLE HAMFEST at Douglas Park in Danville IL on September 1, 1974. Take Bowman Avenue Exit off I-74 and follow the signs. Prizes will include a low-band rig and VHF gear, antennas, electronic keyer, wattmeters, SWR bridges, and many others. Camping and motel accomodations nearby. Food and plenty of parking available. Huge flea market and commercial displays. Tickets are $2 or three for $5. Advance tickets available from Dave WA9PDS, Dolan Rd., Catlin IL 61817. Send check or M.O. and SASE. Talk-in on 22/82 and 94 simplex.

BUY-SELL-TRADE write for monthly mailer, give name, address, call letters. Complete stock of major brands new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc. SSB & FM. Associated Radio, 8012 Conser, Overland Park KS 66204. 913-381-5901.

EQUIPMENT FROM 73

The following list of gear, unless otherwise noted, consists of brand new equipment purchased for testing purposes only. Some have been tested, some remain unopened in original cartons. We are offering this gear at a considerable discount on a first-come-first-served basis. Please send Money Orders or Certified Checks only to 73 Magazine, Peterborough NH 03458.

MITS 908M Calculator w/p.s./case ($143) new	$ 00
Heath IB-101 counter ($170) – 5 figs	$ 140
Vanguard Scaler – by 10 – to 200 MHz ($120)	$ 75
Regency 16ch scanner TME-H-LMU ($300) –new–	$ 245
SBE Scanvision, complete, like new ($900)	$ 500
Pickering CW keyboard KB-1 ($265)–tested	$ 175
Gladding Hi-Scan – 8ch scanner – tested ($188)	$ 99
Motorola KW 2m amplifier – used	$ 350
Heath IC-2009 calculator – brand new ($92)	$ 88
Standard 1400 2m 22ch xcvr 10w ($550) – used	$ 250
Signal One CX7-A – tested – perfect – like new – fantastic	$1990
Kenwood Twins – Tested – like new ($900)	$ 750
Standard 146 2m HT – used ($289)	$ 190
Fannon intercom – exec – 6 ch master – ($60) tested	$ 35
Concord video monitor VM-12 – tested ($400)	$ 250
Concord all channel TV tuner Dem-911 ($600)	$ 250
Bell & Howell 2965 portable VTR – new ($1595)	$ 475
Batteries for B&H 2965 – like new ($36)	$ 25
Regency *450 MHz scanner – ($200) – like new*	$ 140
Varitronics PA-50 2m amp ($110)–brand new–10w in 50 vout	$ 75
HP tone borst gen–5 freq–TB-5–exc($37.50)	$ 26
Hitachi stereo cassette recorder–exc–($120)	$ 75
Hitachi AM-FM cassette recorder exc–($90)	$ 50
Antenna Spec rubber ducky antennas HM-4 2m	$ 4
SWR meter–exc ($25) KW	$ 12
Test Labs–10 in 1–SE-400 ($25) as is	$ 10
Radio Shack Code cassette–new($8)	$ 4
Regency HR-6 ($240) six meter 10w xcvr 12ch	$ 199
Standard SR-C826M ($360) 2m 10w xcvr 12 ch	$ 299
Regency ACT-R8H/L Scr ($160) VHF/UHF 8ch scr receiver	$ 136
Standard SR-C826MA ($398) Latest model 10w 12ch 2m xcvr	$ 339
Regency HR-2MS ($319) 2m 15w xcvr with 8ch scanner	$ 289
SBE SB 450TRC ($180) 450 MHz transverter	$ 149
SBE SB-1PA ($190) 10w in 40w out power amplifier 2m	$ 159
Regency Pocket scanner 4 channel ACT-P4H ($120)	$ 99
Cobra 220 MHz Transceiver 10w 12ch ($300)	$ 255
Amphenol RG-8/U Polyfoam 100' w/PL-259 connectors($24)	$ 19
Standard 14U 2m 22ch superfantastic rig. VOX($510) demo	$ 439
Pacificom 2m HT–brand new–($250)	$ 199

All Prices fob: UPS collect.
73 Magazine – Peterborough NH 03458

462.60MHz FM 6/12V mobile tube tranceivers; 15 complete GE 4ES14A1 450-470MHz 20 watt units for sale, $50 each. Additional specs upon request. Tony Hogg, WHLM Radio, Bloomsburg PA 17815.

FREE BARGAIN CATALOG. Transistors, Relays, ICs, Puts, Leds, Readouts, Resistors, Capacitors, Thermocouples, Transducers, Circuit Boards, Unique Components. Chaney's Dept. A, Box 15431, Lakewood CO 80215.

THE 27th ANNUAL Turkey Run Hamfest and VHF Picnic, sponsored by the Wabash Valley ARA, Inc., will be held Sunday, July 28, at Turkey Run State Park near Rockville, Indiana. Don't miss the Midwest's finest fleamarket. Fun for the whole family: XYL Bingo and fleamarket; food and refreshments, camping facilities, and park recreation for the kids. First Prize: Genave GTX-10, Second Prize: Regency HRT-2, Third Prize: Drake WV-4 VHF Wattmeter; plus many more. Activities begin at 9:00 AM with free coffee and doughnuts. Talk-in 146.94 by W9UUU/9. For details, send SASE to WVARA Hamfest, Box 81, Terre Haute IN 47808.

GREATER Indianapolis Hamfest, Sunday, July 14, 1974, rain or shine, Marion County Fair Grounds, all activities under roof. $2.00 covers gate fee and prize drawing. For information write: Wm. J. Evans, 8104 Crest Hill Dr., Indianapolis IN 46256.

FREE Crystals with the purchase of any 2m FM radio. Write for our deal on the rig of your choice. Factory-authorized dealers for Regency, Drake, ICOM, Alpha, Tempo, Kenwood, Genave, Swan, Clegg, Ten-Tec, Standard, Midland, Telex, Hallicrafters, Venus, Hy-Gain, Galaxy, CushCraft, Mosley and Hustler. For the best deal around on VHF or HF gear, see us first or see us last, but see us before you buy. Write or call us today for our low quote and become one of the many happy and satisfied customers of Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. 812-894-2397.

HAMFESTERS 40th Annual Hamfest and picnic, Sunday August 11, 1974, at Santa Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of Chicago). Exhibits for OM's, XYL's. Famous Swappers Row. Information – contact, Vince Pronites WA9EOM, 7206 So. Damen Avenue, Chicago IL 60636. Tickets write – Jos. Paradyla WA9IWU, 5701 So. California Avenue, Chicago IL 60629.

THE ORIGINAL FM Hamfest Sunday August 4, 1974, near Angola IN. Free flea market, entertainment for ladies and kids. Picnic grounds, campsites, boating, food, soft drinks, available rain or shine. For information contact: Fort Wayne Repeater Assoc. Box 6022, Fort Wayne IN 46806.

ANTIQUE RADIO BUFFS. Do you need a schematic for your radio? For information send SASE showing make and model number. Joseph C. Crockett K3KUL, 762 S. Gulph Road, King of Prussia PA 19406.

TELETYPE EQUIPMENT For Sale: Models 14, 15, 19, 28, 32, 33. TD's, Reperfs, KSR's, ASR's. Parts or complete machines. Write needs and send SASE for complete listing and prices. Larry Pfleger, 10615 W. Ridge Rd., Apt. 54, Hales Corners WI 53130.

"73 MAGAZINES" in binders. First thru latest, make offer on complete set only. Wm. Coldewey Jr. WA8DJS, 5733 Linden Drive, Milford OH 45150.

UPPER PENINSULA Hamfest, August 3 & 4, 1974, Negaunee Township Hall, Negaunee MI. Hiawatha Amateur Radio Association host. Registration $2. Swap n' Shop, Program for XYL's, Door Prizes. Mobiles talk in on 3.920 and 146.94. Reservations & info: Frank K4CGQ/8, 322 Fortress, Sawyer AFB MI 49843. 906-346-5501.

FOR SALE 2 each EIMAC 4CX1000A with sockets and filament trtransformers, $200. Also RCA 7094 with sockets, $18 each. Write: Dave Kiech, 3615 Harrison St., Riverside CA 92504.

WARREN HAMFEST, largest family style hamfest in the East. Sunday, August 18th, at Famous Yankee Lake Park. Giant Fleamarket, Swimming, Picnicing: All free. Details, QSL W8VTD.

KIRLIAN photography kit: Complete, with instructions, $19.95 + $1.50 postage. BOOK: "The Kirlian Aura," $3.95 + $.75 postage. Systecon, Department 21, Box 417, West Hyattsville MD 20782.

WANTED TO BUY Scott Philharmonic XXX or McCurdo Silver Masterpiece VI. David Singer, 10301 Alpine Drive, Cupertino CA 95014.

BCD Adder-Subtractor Experiment. Complete instructions tell how to build, add, subtract, multiply and divide for $2.00. Sollee Enterprises-T, Box 41283, Los Angeles CA 90041.

FOUNDATION for Amateur Radio Annual Hamfest Sunday, October 20, 1974 at Gaithersburg Maryland Fairgrounds.

MIX PLEASURE with pleasure at the Hamburg International Hamfest on September 21. For information contact Lin Brownell WB2HCL, 210 Buffalo, Hamburg NY 14075.

TECH MANUALS for Government surplus gear — $6.50 each: R-390/URR, R-220/URR, URM-25D, CV-591A/URR, CV-278/GR, TRM-1, TS-382D/U, TS-497B/URR, TT-63A/FGC, URM-32. W3IHD, 7218 Roanne Drive, Washington DC 20021.

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding. Literature estes engineering, 543-A West 184 Street, Gardena CA 90248.

SELL Drake 2C Receiver with matching noise blanker crystal calibrator speaker $150 postpaid, George Konnick, Apt. P2, 1750 West Main Street, Riverhead NY 11901.

VIDIO RECORDER Ampex VR6500 like new with vidio monitor and cables $475. Sam Wood 12648 La cresta Ct, Los Altos Hills CA 94022. Telephone 415-941-8000.

MOTOROLA PORTABLES — Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal Services, 6663 Industrial Loop, Greendale WI 53129.

FOR SALE: — TV7B Tube Testers. Some need repairs. $16.95 shipped UPS collect. NJ residents include 5% sales tax. Capacitor materials Inc., P.O. Box 413, West Long Branch NJ 07764.

WANTED: HT200 2 meters, any condition. State price and condition. Ron Dierkens WA6QVE, 3367 Ellington Dr., Altadena CA 91001.

FOR SALE: All issues of 73 Magazine. All reasonable offers considered. Prefer local buyer. D.S. De Armond W6MSD, 100 Glen Eyrie #2, San Jose CA 95125.

SELL: Drake TR4, AC4, MS4 Speaker, Heath HD-10 Keyer, HM-102 Wattmeter, HD-15 Phone Patch, Eico Model 460 DC Wide Band Oscilloscope 2KW Linear Homebrew. All Mint, Best Offer. Knud E. M. Keller c/o 73 Magazine, Peterborough NH 03458.

VERY INTERESTING! Next 5 issues $1. "The Ham Trader," Sycamore IL 60178. (Ask about our "HAM EQUIPMENT BUYERS GUIDE" covering Receivers, transmitters, transceivers, amplifiers 1945–74. Indispensable!)

CRAMPED for antenna space? Slinky Dipole for 80/75, 40 & 20m operates efficiently at 24 feet long on 80m. Money-back guarantee. Complete kit $30.95 ppd., COD $1 extra. Teletron Corp., Box 84-S, Kings Park NY 11754.

MONTREAL HAMFEST 74, August 4, MacDonald College Farm, Ste Anne de Bellevue. Prizes, Giant fleamarket, technical sessions, family fun, $2.50/adult. Info contact: VE2RM, Box 201, Pointe Claire-Dorval, Quebec H9R 4N9.

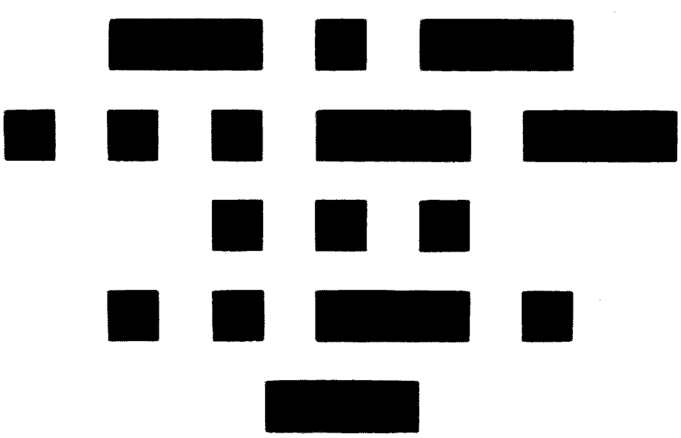
AUTOMATIC TELEPHONE Answering Computer. The best available. List $239.95. I have two new and still in boxes for $150.00 each. Warranty is still good. First check takes one or both. WB8CTA, 1000 Moore Road, Conway MI 49722.

NOW PAYING $1750.00 and up for 618T/ARC-102 — $1200.00 and up for ARC-51 — $1500.00 and up for GRC-106, also parts for these sets. D & R Electronics, R.D.#1, Box 56, Milton PA 17847 after 6:00 1-717-742-4604.

WYOMING RANCH LAND. No QRM-QRN. Wild horses, antalope, deer. 10 acres — $25 down, $25 month. Owner — Michael Gauthier K6ICS, 9418 Florence, Downey CA 90240.

HERE IT IS — Heathkit 10-105 — still in the box unassembled. List $400 — our sensational price $379.00. 73 Magazine, Peterborough NH 03458.

QSL CONTEST



"A stark representation and realization of the universal unimportance of everything. A deeper understanding of the unrealized self revealing all of the traumas and hidden meanings of the inner self." Those were just a few of the comments we received from a well known art critic when he was shown this card. When we told him that it was an amateur radio QSL card and not a work by one of the newer artists around he went away muttering to himself.

However, putting all of the above aside, we proudly announce this month's winner, William W. Ehlers K3SFT, of Sykesville MD. Congratulations.

Even if your card doesn't reveal a message of cosmic importance you have a chance to win a one year subscription to 73. Enter your card today. Send it to 73 Magazine, Peterborough NH 03458.

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JULY 1974

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PROPAGATION CHART

J.H. Nelson

Good (open) Fair (☐) Poor (O)

July — 1974

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	$\boxed{1}$	2	3	4	5	6
$\boxed{7}$	8	9	10	11	$\boxed{12}$	13
14	15	16	17	$\boxed{18}$	19	20
$\boxed{21}$	22	23	24	25	$\boxed{26}$	27
28	29	$\boxed{30}$	$\boxed{31}$			

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7A	14	7	7	7	7	7	7	7	7	7	7
ARGENTINA	14	14	14	7	7	7	14	14	14	14	14	14
AUSTRALIA	14	14	14B	7B	7	7	7	7	7	7	14	14
CANAL ZONE	14	14	7A	7	7	7	7	14	14	14	14	14
ENGLAND	7A	7	7	7	7	7	7A	14	14	14	14	14
HAWAII	14	14	7A	7	7	7	7	7	7	7A	14	14
INDIA	7	7	7B	7B	7B	7B	7	7	7A	14	14	14
JAPAN	14	14	7	7	7	7	7	7	7	7	7	14
MEXICO	14	14	7	7	7	7	7	7	7	14	14	14
PHILIPPINES	14	14	7B	7B	7B	7B	7B	7	7	7	7A	7A
PUERTO RICO	14	7	7	7	7	7	7	7	14	14	14	14
SOUTH AFRICA	7B	7	7	7	7B	14	14	14	14	14	7B	7B
U. S. S. R.	7	7	7	7	7	7	14	14	14	14	14	14
WEST COAST	14	14	14	7	7	7	7	14	14	14	14	14

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7	7	7	14
ARGENTINA	14	14	14	7A	7	7	7	14	14	14	14	14
AUSTRALIA	14	14	14	14	7	7	7	7	7	7	14	14
CANAL ZONE	14	14	14	7	7	7	7	14	14	14	14	14
ENGLAND	7	7	7	7	7	7	7	7	7	14	14	14
HAWAII	14	14	14	7	7	7	7	7	7A	14	14	14
INDIA	14	7	7B	7B	7B	7B	7	7	7	7	7A	7A
JAPAN	14	14	14	7	7	7	7	7	7	7	7	14
MEXICO	14	7	7	7	7	3A	7	7	7	7	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	7	7	7	7A	7A
PUERTO RICO	14	14	7	7	7	7	7	14	14	14	14	14
SOUTH AFRICA	7B	7	7	7	7B	7B	14	14	14	14	7B	7B
U. S. S. R.	7	7	7	7	7	7	7	7	7	7A	14	14

WESTERN UNITED STATES TO:

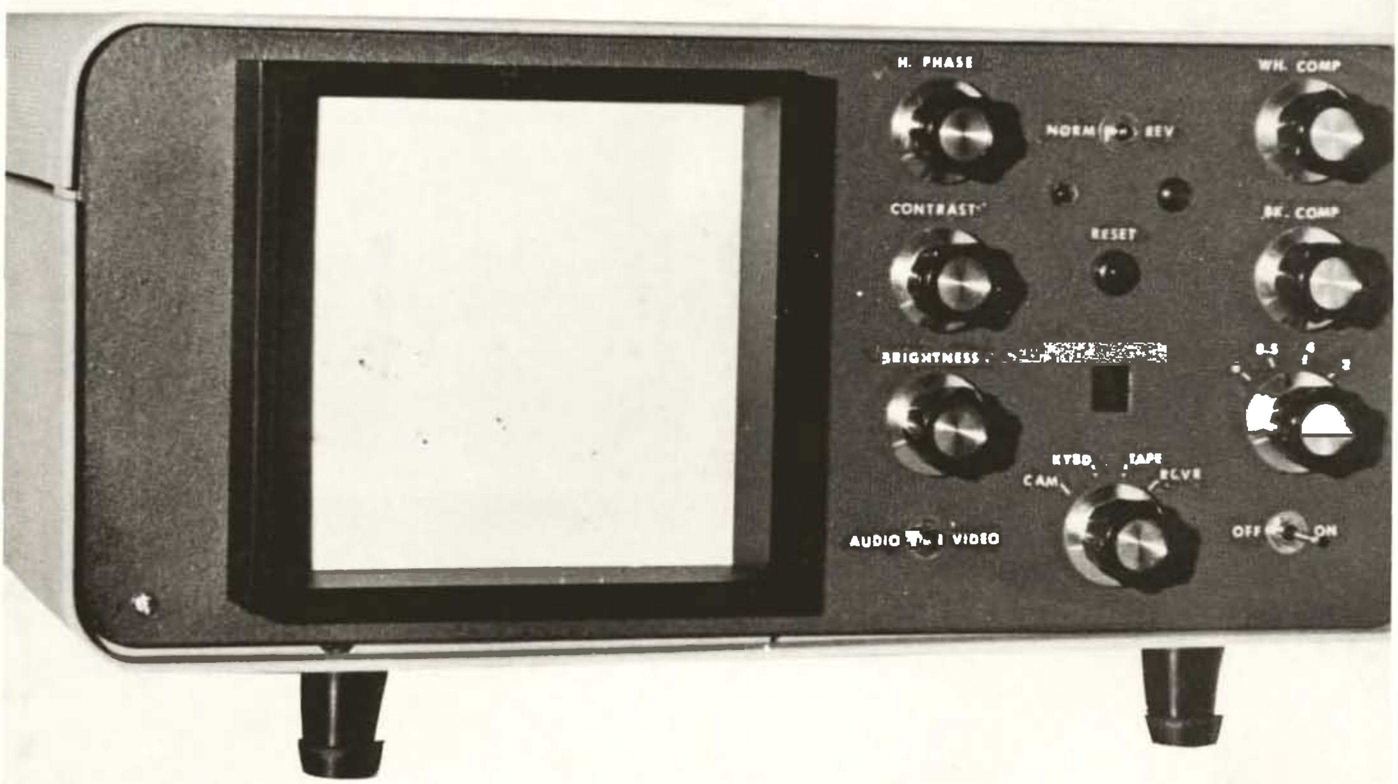
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7A	7A	7A	7	7	7	7	7	7	7	7	7A
ARGENTINA	14	14	14	7A	7	7	7	14	14	14	14	14
AUSTRALIA	14	14A	14	14	7A	7	7	7	7	7	14	14
CANAL ZONE	14	14	14	7	7	7	7	14	14	14	14	14
ENGLAND	7A	7	7	7	7	7	7	7	7	7A	7A	14
HAWAII	14	14	14A	14	14	7	7	7	7	14	14	14
INDIA	14	14	14	7B	7B	7B	7	7	7	7	7	7A
JAPAN	14	14	14	14	7	7	7	7	7	7	14	14
MEXICO	14	14	14	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	14	7	7	7	7	7	14	14	14
PUERTO RICO	14	14	7A	7	7	7	7	14	14	14	14	14
SOUTH AFRICA	7B	7B	7	7	7B	7B	7B	7B	14	14	7B	7B
U. S. S. R.	7	7	7	7	7	7	7	7	7	7A	7A	7
EAST COAST	14	14	14	7	7	7	7	14	14	14	14	14

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

73 magazine
for radio amateurs

$1.00
AUGUST 1974

THE SCAN CONVERTER
SSTV with ANY TV camera



a new slow scan BREAKTHROUGH

Other Features . . .

CLASS X LINEARS . . .
450 MHz FETs . . .
R–390 & R–392 MODS . . .
SWR METER YOU CAN BUILD . . .
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73 magazine for radio amateurs

167 AUGUST 1974

FEATURES

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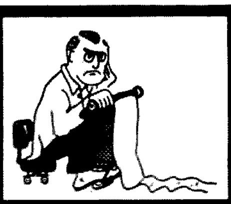


NEVER SAY DIE

...de W2NSD/1

EDITORIAL BY WAYNE GREEN

MORE IRS?

Several readers have suggested that 73 is not the best place for information about the IRS. I agree – completely. But, unfortunately, the publications that should be publishing this information are afraid to do it and the sad fact is that outside of 73 the chances are that you won't find much information available. Even big multimillion-dollar Playboy seems afraid of the IRS.

The complaining readers have been few and far between compared to those demanding more on the IRS scandal, so we'll give a little more. We're getting the inside dope on the ways many people are successfully not paying any taxes at all and you may be sure we'll pass them along when we know they are good.

Many readers have been sending in newspaper clippings of IRS harrassments and some are bad enough to warrant some space here – such as the recent story about the 71 year old widow in Fort Worth. Her husband had been broken by the IRS, who was sure that he had hidden some money and persecuted him for over twenty years. The IRS hauled him into court with a charge of tax evasion. He didn't want to plead guilty since he had done nothing wrong, but his lawyer convinced him it would be the best thing to do, just to settle the case. He had started as a day worker and built up to owning the Maxwell Steel Company. The IRS took everything he had, some $189,000 in stock, cash, property and life insurance of $168,000 plus 50% fraud penalty claim by the IRS. Maxwell, crushed, died, leaving his widow with nothing but the house she was living in and her Social Security pension – which the IRS informed her they could confiscate. The IRS is in the process of selling the house and may take her pension. The widow can never have a dime of her own and will live under the tax claim until she dies.

Perhaps it really is time for a tax reform which would get rid of the IRS.

ADVISORY COMMITTEE?

The hearing held in January made such an impression on the Commission that there has been increasing pressure for some sort of standing ham committee which could work with the FCC on the formulation of amateur rules and policy. The radio industry has several of these committees and the FCC finds them most helpful.

An advisory committee must meet certain FCC standards such as its chairman is normally an FCC official – the committee must have an organization structure, regular or periodic meetings and a fixed membership. The membership is chosen by the committee chairman and must be balanced as to points of view to make sure that special interests do not have inproportionate influence, and discrimination is prohibited.

The usual procedure is for the committee chairman to ask for members to be nominated. The public then petitions for membership and the chairman selects the members.

To get an advisory committee started the request for it must originate with the FCC staff – this request is then reviewed and approved by the Commission and the O.M.B. The establishment is then published in the Federal Register and a charter is prepared by the FCC which is filed with Congress and the Library of Congress. This charter is reviewed annually by the FCC and the O.M.B., and must be renewed every two years.

Meetings are called by the chairman, who approves the agenda, chairs the meetings and adjourns the meetings. The notice of meetings is published in the Federal Register and the meetings are normally open to the public. The Public Information Act applies to committee records.

The Commission appears to now be serious about setting up an advisory committee – and the next move seems to be up to them. In the meanwhile you might give serious and careful thought to who you might petition the Commission to speak for you on this committee. You'll need active amateurs – preferably amateurs who have had extensive expereince in several aspects of the hobby so they will have the background needed to help provide data to the Commission and give educated opinions. There is no prohibition against members of the committee being in the industry, though obviously not too many should, lest there be an unconscious bias toward the business end of amateur radio. Think about it.

W1AW QUIETED BY FCC

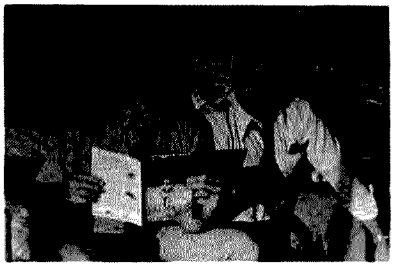
Under a recent FCC interpretation of their rules the operation of W1AW has been substantially curtailed. The station can still be used for the transmission of bulletins and code practice, but no longer may it be used for two way contacts with other amateur stations by any ARRL staff members. Visitors may use the station for such contacts.

A ruling by the Wages and Hours people shut down the 73 Magazine HQ station in 1965 when they ruled that any operator of the station *MUST* be paid at least the minimum wage. They pointed out that the operators of W1AW were being paid. 73 Magazine appealed to the FCC for advice and was informed that it was *ILLEGAL* for operators at the 73 Magazine station to be paid. The result of this was the shut down of the station on Mt Monadnock, one of the most elaborate amateur VHF installations in the world, financed by 73 Magazine and set up by 73 employees. The station had been operated by employees in their off hours, evenings and weekends for the fun of operating.

This same ruling forced the ARRL to pay their HQ station operators for all operating, both bulletin broadcasting and hamming. The FCC kept quiet about this, condoning it, until the recent action described above.

POSSIBLE NEW PRODUCTS?

We're still looking around for some company to come out with a small and stable oscillator which could plug into the 2m FM rigs to provide a general tuning function for the receivers. For normal repeater operation crystals are just fine – they're perfect. But every now and then it is nice to be able to tune the band and hear what is going on off your crystal channels. There might be some secret repeaters – some new repeaters you haven't heard about – some simplex



Visitors – Blackie JY9BB is on the left – active on most bands from Amman, and also via Oscar. On the right is Hisham Ansari JY5HA, the Secretary of the Royal Jordanian Amateur Radio Society. Hisham is the one who has been teaching the youngsters of Jordan about amateur radio and issuing them their licenses. Blackie and Hisham were recently in the U.S. for some technical training.

channels being used you didn't know about – or you might just be in a new area for a visit and want to be able to hear all of the repeaters without having to come armed with a cigar box full of crystals.

It should be pretty simple to come up with a small oscillator which would plug into one of the crystal sockets and provide variable tuning of the whole band, even including the Mars and CAP channels on each end of the ham band.

The inclusion of a tuner in the new TPL 220 transceiver is something that other manufacturers might check. It obviously doesn't cost all that much to include that function once you have the whole receiver there anyway. TPL also has a VFO for use on transmit – plus an AM-FM switch. On 2m this would permit you to go down the band and work some of those few remaining AMers – or even get in there for some CW when aurora is active, way down on the very low end of the band.

$100 REWARD!

Many amateurs – if not most – get caught up in one aspect of the hobby and turn a blind eye to all of the other things that are going on. Well, few of us have the time to do much of a job of pursuing more than one aspect of amateur radio at a time, but this means that we are missing out on a lot of the fun that is there to be had.

The time does come when we find that the same old grind doesn't have the zip it once had for us and we notice that we are operating a lot less – sometimes not getting on the air for days at a time. It is possible that an interest in more than one phase might be an answer to that phenomenon.

Since amateurs are actively having a ball with many different sub-hobbies, it is probably a lack of knowing about these things more than anything else that is holding back many amateurs from expanding their horizons. In the hope of bringing light to this grey area, 73 would like to encourage material to be written for publication which would help others to understand the many facets of amateur radio – and perhaps convince them to give something new a try.

Accordingly, 73 is offering $100 reward for the best article received in the categories of an introduction to:

CW	Fast Scan Television
DXing	Moonbounce
QRP	Certificate Hunting
RTTY	DXpeditioning
Slow Scan	160 Meter DXing
Contests	Mobiling
Traffic Handling	80 Meter DXing
MARS	Service Nets (Ecars)
Home Building	RACES CD – etc.
Facsimile	

Here is Dave WA1UFG, one of the new hams licensed at the Crotched Mountain Rehabilitation Center, operating 2m from his wheelchair – using the special call sign WC1CMC (Wheel Chair One Crotched Mountain Center) during the weekend of the wheelchair games which is celebrated every year at the Center, which is located in Francistown NH. The radio club there is active and getting many of the students licensed.

200 WATT 2m AMPLIFIER

TPL in Hawthorne, California has been making some experimental 200 watt mobile amplifiers, but there are problems. It seems that most of the mobile antennas – the 5/8 wave jobs that most fellows are using now – won't take all that power. Watch out for someone to come out with a Big Mutha for FM. TPL has a price tag of about $350 on the amplifiers if you just can't stand not being the biggest bully on the repeater. For sure they hear you when you say, "Break!"

Many denizens of Flatland can see no reason why anyone should run much more than maybe 25 watts mobile. They can not see this enough so they are quite vocal about it. Nasty sometimes. There are some ways of rationalizing higher power – these would be clearer to them if they spent some time driving around the mountains where a ten watt signal drops out of the repeater when you get behind a little hill – and most of the roads are in the valleys, not on the mountain tops. With some beef behind the signal you can hold on to the repeater even when you're in a gulch for a bit.

W6 – KH6 Team Waiting FOR 2m FM QSO

The FM DXers in California and Hawaii are monitoring 146.52 – .55 – .58 nightly, waiting for that inevitable band opening between the two areas. Two amateurs waited it out in the 50's and won the Edison Award for their diligence – that was a prize awarded each year by General Electric to outstanding amateurs – back when G.E. sold a lot of tubes for ham rigs.

One of these evenings the band will be open and the contact will be made – who will go down in the record books this time?

MICROWAVE OVEN

Visitors to 73 Magazine seldom miss commenting on the microwave oven in the lunchroom. This certainly was one of the better investments made by the magazine and it is used every day for so many things that it is difficult to see how one could get along without it now.

Ten seconds softens refrigerator hard butter to spreading softness. A week old hard roll in a Baggie (to keep the moisture from escaping) is like oven fresh in about 20 seconds. If it is really hard it can be moistened a bit before putting in the oven. Fresh baked apples for lunch take about three minutes for the large ones – you core them, put some sugar, cinnamon, a couple of raisins and some butter or oleo in the hole, put them in a small covered dish and into the oven. Any sandwich that is better hot can be made like better than new in twenty seconds or so. Your coffee a little cool? Zap it for ten seconds. You can even have a fresh baked potato for lunch – about five minutes! Hot soup takes a couple minutes. Even (ugh!) canned hash is less unappealing after a couple of minutes of warming up. . . but not much.

There has been a good deal in the papers about oven leakage so the unit at 73 is checked out every few weeks – not a smidgeon of leakage yet. The oven came from International Crystal of Oklahoma City and, after several years, has given absolutely no trouble whatever. The leakage checker was sent along at no charge so the oven could be checked. When you consider

Cont'd page 111.

Gam Antenna Installed – Andy Nuttle of Gam in Manchester NH is installing one of his new two meter antennas on the 73 Test Car – the Datsun 240Z. Andy makes just about every part of these antennas himself in his highly automated factory. The SS-2 is designed to have a particularly low angle of radiation, thus squirting the rf in the desired direction and not up toward some passing plane as with some of the 2m antennas in use today.

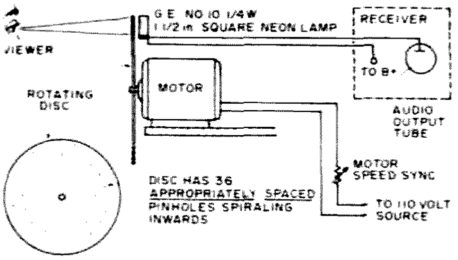
SSTV SCENE

Dave Ingram K4TWJ
Rte. 11, Box 499, Eastwood Vil. 50N
Birmingham AL 35210

Would you believe amateur TV was around in 1928? It's true, although it differed tremendously from any system used today. In 1928 the General Electric Company in Schenectady NY was transmitting experimental TV signals on "wavelengths which were located by listening for unusual signals." (Available information indicates this was probably between the broadcast band and 80m.) Commercial "converter kits" were available from manufacturers like Daven Company, and QST ran a build-it-yourself article in May, 1928, for the technically minded amateur.

Basically, this TV system used a neon lamp to replace the receiver's earphones, (which were usually connected between the last audio stages plate and B+) and the Nipkow scanning disc principle. The theory here was while the incoming signal "blinked the neon lamp in a picture manner," the disc would rotate at approximately 1700rpm to place this information at the appropriate points for reconstruction of sketches in their simplest black and white form. The neon lamp's flat surface area was viewed through the disc while varying the motor rheostat until it acquired the same speed as the transmitting disc, at which time a picture was to appear rather than just a "meaningless group of dots." If the neon lamp was too dim, either lowering the grid bias or increasing B supply voltage was suggested. This was an experimental setup and I have yet to find information on how well (if at all) the system performed, although there were opinions manufacturers would soon build larger neon lamps for larger pictures. While investigating this "nostalgic TV," another item was uncovered which is worth mentioning here. In 1932, W2XF was transmitting TV programs from a QTH in Al Smith's Empire State Building to "local residents." Hams and commercial TV? Can any of you old timers shed some light on this era?

As I mentioned briefly in last month's column, this year's Dayton Convention was Slow Scan TV's greatest yet, and was suitably dubbed "The year of the Digital Scan Converter." There were actually four different slow to fast scan converters in operation at the SSTV booth: The WØLMD unit, the W9NTP unit, the WB9LVI unit and the VE3GZM/VE3DVV unit. Although all units used the same basic idea – that of first storing a Slow Scan picture then outputing this at Fast Scan rates into a conventional TV, they differed somewhat in specific circuitry. The W9NTP and WØLMD units varied primarily in "front end design," however, both units used memories which were "loaded on the fly" with up to 128 horizontal picture elements per line. Their continuously recirculating memory provided maximum utilization of the approximate 65000 bit storage. The VE3GZM/VE3DVV Scan Converter was an interesting unit. It used a large MOS shift register memory and the composite Slow Scan picture was loaded into this sync and all. The memory was then sped up 1000 times and output directly at a Fast Scan rate. . .sync included. This is simple enough provided one can lay hands on the necessary shift registers. (These guys have a really interesting story on their procurement of the surplus shift registers. If you catch them on the air, be sure to ask about it!) I understand the WB9LVI unit provided very good quality fast scan pictures with exceptional stability, but as yet I have no additional information other than what appeared in the May column on Steiber's unit. I hope to have more specific information soon. I might mention the heart of these scan converters were surplus MOS shift register ICs, (2525s) which are rather difficult to locate at low prices. All four scan converters were operating continuously at the SSTV booth; two being fed from tape recorders and two from SSTV Digital Keyboards, which also attracted quite a bit of attention. In fact, the SSTV booth boasted a large crowd all the time.



1928 style TV system for amateur test.

Final Results
Worldwide SSTV Contest
Sponsored by CQ Elettronica
and 73 Magazine
9-10 February 1974

1)	W9NTP	(77+5) x / (5x6) + (2x42) /	= 9.348
2)	WA1NXR	(44+0) x / (5x4) + (2x28) /	= 3.344
3)	WA7QBV	(42+0) x / (5x3) + (2x28) /	= 2.982
4)	WB4ECE	(43+0) x / (5x4) + (2x21) /	= 2.666
5)	IT9ZWS	(34+0) x / (5x3) + (2x25) /	= 2.210
6)	HB9NL	(31+0) x / (5x6) + (2x19) /	= 2.108
7)	WA1KYV	(33+0) x / (5x4) + (2x21) /	= 2.046
8)	EA4DT	(34+0) x / (5x4) + (2x17) /	= 1.998
9)	EA4JF	(38+0) x / (5x3) + (2x17) /	= 1.862
10)	DK5EL	(30+8) x / (5x3) + (2x16) /	= 1.786
11)	G3IAD	(33+0) x / (5x3) + (2x17) /	= 1.617
12)	HA6VK	(24+0) x / (5x3) + (2x18) /	= 1.224
13)	IØPCB	(22+0) x / (5x3) + (2x17) /	= 1.078
14)	IT9ZDA	(26+0) x / (5x2) + (2x14) /	= 988
15)	CT1PG	(26+0) x / (5x2) + (2x13) /	= 936
16)	I1PXC	(23+1) x / (5x3) + (2x12) /	= 897
17)	OZ1AT	(22+0) x / (5x3) + (2x12) /	= 858
18)	I3HDC	(15+0) x / (5x3) + (2x10) /	= 525
19)	K9BTU	(16+0) x / (5x2) + (2x10) /	= 480
20)	JA1ARA	(14+0) x / (5x3) + (2x7) /	= 406
21)	JA7FS	(10+0) x / (5x3) + (2x7) /	= 290
22)	VE6SL	(11+0) x / (5x1) + (5x1) /	= 187
23)	ISØPEM	(9+0) x / (5x1) + (2x6) /	= 153
24)	OZ2YC	Control Log	
25)	SMØCQV	Control Log	

Incidentally, while on the subject of Dayton, I wonder if any of you have found a really good application for those LED dual diodes which were so popular. These little gems (which were fairly inexpensive) will light green when passing current in one direction and red when passing current in the other direction. I tied one on a switching transistor base in an FM rig for a T/R light, however, that's a far cry from its total capability. How about a sync tuning indicator that lights green if sync frequency is low, red if sync frequency is high, and orange if sync is exactly right on? Any other ideas? If so, send me your ideas and schematic. . .I'll get them into a future column.

I have just received the final world results of the SSTV contest from Franco I1LCF, which are included in this month's column. Congratulations to all for a fine contest, and we hope to "see" you do it again (only better) next year.

Finally, word just in from Barry VK5BS, who's quite active on SSTV from Australia, tell's of their SSTV net which gathers at 0100 GMT Sundays on 14.230kHz. They have a fine group active which includes VK3LM, 2KK, 3TE, 4TO and VK5BS. VK8KK now has a "video synthesizer" keyboard going, and P29MC is on SSTV from New Guinea. VK9XX and FO8AA also have joined the SSTV activity, and it looks like quite a few others are due on soon. Ah. . . for the better propagation soon to come.

K4TWJ

FCC NEWS

Adopted: June 5, 1974;
Released: June 7, 1974
By the Commission: Commissioner Quello not participating.

1. Notice of Proposed Rule Making in the above entitled matter is hereby given.

2. The Commission has under consideration a petition (RM-2349) filed by the American Radio Relay League (ARRL). Petitioner requests the Commission to issue an Order deleting §97.89(c) of the rules. This section now prohibits more than two repeater stations being operated in tandem, i.e., one station repeating the transmission of the other, except for emergency operations.

3. The ARRL claims a formal rule making proceeding is unnecessary in this matter, citing §553(b) of the Administrative Procedures Act and §1.412(c) of the Commission's Rules, as authority to support their position. Pursuant to those subsections general notice of proposed rule making must be published except in certain limited instances. Petitioner does not show that the proposed rule deletion comes within those exceptions.

4. In support of the requested deletion, the ARRL offers the following claims and arguments:

A. Some amateur radio organizations planning to develop networks of repeater stations for use in times of disasters are unwilling to implement their plans unless the networks can also be used for other amateur operations.

B. In the more sparsely populated areas of the country, linked repeater stations can provide more reliable communications than can operation in the high frequency amateur bands.

C. In the more densely populated areas of the country, linking of repeater stations is neither necessary nor desired by amateurs, and the privilege of linking would be self-limiting.

5. Our findings, as stated in the Report and Order in Docket 18803, 37 FCC 2d 225 (1972), upon review of the comments filed in that Docket, are that amateur repeater stations are useful for increasing the range of VHF and UHF vehicular and handheld mobile stations in conducting intra-community amateur radio communications, and for effecting emergency radio communications which possibly could not otherwise be conducted on the amateur bands. Also, in the interests of spectrum conservation, we found the majority of situations could be accommodated with a maximum of two linked repeaters. In practice, these findings have been verified through information filed with applications for repeater stations. The vast majority of repeaters use considerably less effective radiated power than is permitted, indicating most amateur repeater stations are intended for local, or intra-community, use. No specific instance of even two linked repeaters for general amateur radio communications has come to our attention. However, this aspect would not normally come to our attention. We are inclined to agree with the ARRL that the prohibition is unnecessary, since in more densely populated areas, amateurs apparently do not desire to link repeater stations In the less densely populated areas spectrum conservation is not as critical as elsewhere.

6. Therefore, we propose to delete §97.89(c),

7. Authority for these proposed amendments is contained in Section 4(i) and 303 of the Communications Act of 1934, as amended.

8. Pursuant to applicable procedures set forth in §1.415 of the Commission's Rules, interested persons may file comments on or before September 18, 1974, and reply comments on or before October 2, 1974. In accordance with the provisions of §1.419(b) of the Commission's Rules, an original and fourteen copies of all statements, briefs and comments filed shall be furnished the Commission. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken. The Commission may also take into account other relevant information before it, in addition to specific comments invited by this Notice. Responses will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, D.C.

Adopted: June 12, 1974
Released: June 17, 1974

SUBPART F – RADIO AMATEUR CIVIL
EMERGENCY SERVICE (RACES)
General

§97.161 Basis and Purpose.

The Radio Amateur Civil Emergency Service provides for amateur radio operation for civil defense communications purposes only, during periods of local, regional or national civil emergencies, including any emergency which may necessitate invoking of the President's War Emergency Powers under the provisions of §606 of the Communications Act of 1934, as amended.

§97.163 Definitions.

For the purposes of this subpart, the following definitions are applicable:

(a) Radio Amateur Civil Emergency Service. A radiocommunication service conducted by volunteer licensed amateur radio operators, for providing emergency radiocommunications to local, regional, or state civil defense organizations.

(b) RACES station. An amateur radio station licensed to a civil defense organization, at a specific land location, for the purpose of providing the facilities for amateur radio operators to conduct amateur radiocommunications in the Radio Amateur Civil Emergency Service.

R97.165 Applicability of rules.

In all cases not specifically covered by the provisions contained in this subpart, amateur radio stations and RACES stations shall be governed by the provisions of the rules governing amateur radio stations and operators (Subparts A through E of this part).

Station Authorizations

§97.169 Station license required.

No transmitting station shall be operated in the Radio Amateur Civil Emergency Service unless:

(a) The station is licensed as a RACES station by the Federal Communications Commission, or

(b) The station is an amateur radio station licensed by the Federal Communications Commission, and is certified by the responsible civil defense organization as registered with that organization.

§97.171 Eligibility for RACES station license.

A RACES station will only be licensed to a local, regional or state civil defense organization.

§97.173 Application for RACES station license.

(a) Each application for a RACES station license shall be made on the FCC Form 610-B.

(b) The application shall be signed by the civil defense official responsible for the coordination of all civil defense activities in the area concerned.

(c) The application shall be countersigned by the responsible official for the governmental entity served by the civil defense organization.

(d) If the application is for a RACES station to be in any special manner covered in § 97.41, all of the showings as specified in § 97.41 for non-RACES stations shall also be submitted.

§ 97.175 Amateur radio station registration in civil defense organization. No amateur radio station shall be operated in the Radio Amateur Civil Emergency Service unless it is certified as registered in a civil defense organization, by that organization.

Operating Requirements

§ 97.177 Operator requirements

No person shall be the control operator of a RACES station, or shall be the control operator of an amateur radio station conducting communications in the Radio Amateur Civil Emergency Service unless (a) that person holds a valid amateur radio operator license, and (b) that person is certified as enrolled in a civil defense organization, by that organization.

§ 97.179 Operator privileges.

Operator privileges in the Radio Amateur Civil Emergency Service are dependent upon, and identical to, those for the class of operator license held in the Amateur Radio Service.

§ 97.189 Availability of RACES station license and operator licenses.

(a) The original license of each RACES station, or a photocopy thereof, shall be attached to each transmitter of such station, and at each control point of such station. Whenever a photocopy of the RACES station license is utilized in compliance with this requirement, the original station license shall be available for inspection by any authorized Government official at all times while the station is being operated and at other times upon request made by an authorized representative of the Commission, except when such license has been filed with application for modification or renewal thereof, or has been mutilated, lost, or destroyed, and request has been made for a duplicate license in accordance with § 97.57.

(b) In addition to the operator license availability requirements of § 97.83, a photocopy of the control operator's amateur radio operator license shall be posted at a conspicuous place at the control point for the RACES station.

Technical Requirements

§ 97.185 Frequencies available.

(a) All of the authorized frequencies and emissions allocated to the Amateur Radio Service are also available to the Radio Amateur Civil Emergency Service on a shared basis.

In the event of any emergency which necessitates the invoking of the President's War Emergency Powers under the provisions of § 606 of the Communications Act of 1934, as amended, unless modified or otherwise directed, RACES stations and amateur radio stations participating in RACES will be limited in operation to the following:

Frequency or Frequency Bands kHz	Limitations
1800-1825	1
1975-2000	1
3515-3550	2, 4
3984-4000	
3997	3
7097-7103	4
7103-7125	2, 4
7245-7255	2, 4
14047-14053	4
14220-14230	2, 4
21047-21053	4
MHz	
28.55-28.75	
29.45-29.65	
50.35-50.75	
53.30	3
53.35-53.75	
145.17-145.71	
146.79-147.33	
220-225	

(c) Limitations.

(1) Use of frequencies in the band 1800-2000 kHz is subject to the priority of the Loran system of radionavigation in this band and to the geographical, frequency, emission and power limitations contained in § 97.61 of the rules governing amateur radio stations and operators (Subparts A through E of this part).

(2) The availability of the frequency bands 3516-3550 kHz. 7103-7125 kHz, 7245-7247 kHz, 7253-7255 kHz, 14220-14222 kHz and 14228-14230 kHz for use during periods of actual civil defense emergency is limited to the initial 30 days of such emergency, unless otherwise ordered by the Commission.

(3) For use in emergency areas when required to make initial contact with military units; also, for communications with military stations on matters requiring coordination.

(4) For use by all authorized stations only in the continental United States, except that, the bands 7245-7255 and 14.220-14.230 kHz are also available in Alaska, Hawaii, Puerto Rico, and the Virgin Islands.

Use of Stations

§ 97.189 Points of communications.

(a) RACES stations may only be used to communicate with:

(1) Other RACES stations.

(2) Amateur radio stations certified as being registered with a civil defense organization, by that organization.

(3) Stations in the Disaster Communications Service.

(4) Stations of the United States Government authorized by the responsible agency to exchange communications with RACES stations.

(5) Any other station in any other service regulated by the Federal Communications Commission, whenever such station is authorized by the Commission to exchange communications with stations in the Radio Amateur Civil Emergency Service.

(b) Amateur Radio Stations registered with a civil defense organization may only be used to communicate with:

(1) RACES stations licensed to the civil defense organizations with which the amateur radio station is registered.

(2) Any of the following stations upon authorization of the responsible civil defense official for the organization in which the amateur radio station is registered:

(i) Any RACES station licensed to other civil defense organizations.

(ii) Amateur radio stations registered with the same or another civil defense organization.

(iii) Stations in the Disaster Communications Service.

(iv) Stations of the United States Government authorized by the responsible agency to exchange communications with RACES stations.

(v) Any other station in any other service regulated by the Federal Communication Commission, whenever such station is authorized by the Commission to exchange communications with stations in the Radio Amateur Civil Emergency Service.

§ 97.191 Permissible communications.

All communications in the Radio Amateur Civil Emergency Service must be specifically authorized by the civil defense organization for the area served. Stations in this service may transmit only civil defense communications of the following types:

(a) Communications concerning impending or actual conditions jeopardizing the public safety, or affecting the national defense or security during periods of local, regional civil emergencies:

(1) Communications directly concerning the immediate safety of life or individuals, the immediate protection of property, maintenance of law and order, alleviation of human suffering and need, and the combating of armed attack or sabotage.

(2) Communications directly concerning the accumulation and dissemination of public information or instructions to the civilian population essential to the activities of the civil defense organization or that of other authorized governmental or relief agencies.

(b) Communications for training drills and tests necessary to insure the establishment and maintenance of orderly and efficient operation of the Radio Amateur Civil Emergency Service as ordered by the responsible civil defense organization served. Such tests and drills may not exceed a total time of one hour per week.

(c) Brief one way transmissions for the testing and adjustment of equipment.

§97.193 Limitations on the use of RACES stations.

(a) No station in the Radio Amateur Civil Emergency Service shall be used to transmit or to receive messages for hire, nor for communications for material compensation, direct or indirect, paid or promised.

(b) All messages which are transmitted in connection with drills and tests shall be clearly identified as such by use of the words "drill" or "test," as appropriate, in the body of the messages.

CONTESTS

Tom DiBiase WB8KZD
708 6th Avenue
Steubenville OH 43952

QRP QSO PARTY RULES

QRP Amateur Radio Club International, Inc.

Starts: 2000 GMT Sat., Aug. 24, 1974
Ends: 0200 GMT Mon., Aug. 26, 1974

This contest is open to all amateurs and all amateurs are eligible to compete for awards.

Exchanges: Members: RST/RS, State /Province/Country, QRP No.; Nonmember: RST/RS, State/Province/ Country, Power.

Scoring: Stations may be worked once per band for QSO and multiplier credit. Each member contact counts as three (3) points, and each nonmember contact counts as two (2) points. Non- W/VE stations count as four (4) points.

Multipliers: More than 100 watts (200 PEP) X 1.0; 25 to 100 watts (50-200 PEP) X 1.5; 5 to 25 watts (10-50 PEP) X 2.0; 1 to 5 watts (2-10 PEP) X 3.0; Less than 1 watt (2 PEP) X 4.0.

Score: QSO points X Total No. States, provinces and countries per band X appropriate power multiplier.

Frequencies: CW: 3540, 7040, 14065, 21040, 28040; SSB: 3855, 7260, 14260, 21300, 28600, 50350; Novice: 3720, 7120.

Call: CQ QRP.

Awards: Certificates will be awarded to the highest scoring station in each state, province and country. Second and third place awards will be given where activity warrants. A certificate will also be awarded to the lowest power station showing at least three genuine skip contacts.

Logs: Send logs to Bill Fallon W4KFB, 124 Stoll Avenue, Louisville KY 40206. Send full log date, bands used, equipment and power level used.

Note: Look for DX stations on 7030 at appropriate hours.

NEW BERN

The city of New Bern NC is celebrating its Bicentennial August 16-25. I have applied to the FCC for a special call for operations during that period. The call is KB4ERN. A special QSL commemorating the event is planned. The New Bern amateurs will be active from public events during the week and will be on the local TV station. We are especially interested in QSOing stations in Bern, Switzerland. Operation is planned for 80 through 10m, CW and SSB, 20m Slow Scan, and 2m FM via repeater. For more information contact James L. Cason II WB4CCU, 5213A Trentwood Drive, New Bern NC 28560.

WB8KZD

AMSAT NEWS

OSCAR 6

Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

"LICENSING ARRANGEMENTS FOR AMSAT-OSCAR 7"

On March 15, 1974, AMSAT was issued a special license for the AMSAT-OSCAR 7 satellite, with the call letters W3OHI. Unique in that this is perhaps the first actual license issued to an amateur satellite service space station, the new license culminates six months of discussions and meetings between AMSAT and the U.S. Federal Communications Commission concerning the specific provisions governing the operation and use of OSCAR 7

With the license the following waivers were granted for OSCAR 7 after launch and for portable or mobile operation of the spacecraft during tests before launch:

A. Section 97.43: The requirement for every amateur radio station to have one land location was waived.

B. Section 97.61: Any mode of emission authorized on uplink frequencies may be retransmitted on the downlink. (For example, teletype transmissions allowed on two meters can be retransmitted on the ten-meter downlink of the two-to-ten meter repeater, even though teletype is not ordinarily permitted at the high end of the ten-meter band.)

C. Sections 97.7 and 97.79: Any transmissions to the satellite from amateur radio stations may be retransmitted by the satellite without regard to operator frequency privileges on the satellite downlink frequencies. (This means that, as with OSCAR 6, Technician Class licenses will be permitted to use the two-to-ten meter repeater, even though their signals will be retransmitted on ten meters, a band not normally allowed to Technicians.)

D. Sections 97.117 and 97.123: Telecommand stations authorized by AMSAT may transmit coded telecommand signals to the satellite, without identifying their transmissions.

E. Section 97.87: The various requirements for identification of the satellite's transmissions were waived to the extent that only the last two letters, HI, of the call sign W3OHI need be periodically transmitted by the satellite.

Orbital Information

Orbit	Date (Aug)	Time (GMT)	Longitude of Eq. Crossing °W
8194	1	0055.1	62.1
8207	2	0150.0	75.8
8219	3	0049.9	60.8
8232	4	0144.8	74.5
8244	5	0044.8	59.5
8257	6	0139.7	73.2
8269	7	0039.6	58.2
8282	8	0134.6	71.9
8294	9	0034.5	56.9
8307	10	0129.4	70.7
8319	11	0029.4	55.6
8332	12	0124.3	69.4
8344	13	0024.2	54.4
8357	14	0119.2	68.1
8369	15	0019.1	53.1
8382	16	0114.0	66.8
8394	17	0014.0	51.8
8407	18	0108.9	65.5
8419	19	0008.8	50.5
8432	20	0103.8	64.3
8444	21	0003.7	49.2
8457	22	0058.6	63.0
8470	23	0153.5	76.7
8482	24	0053.5	61.7
8495	25	0148.4	75.4
8507	26	0048.3	60.4
8520	27	0143.3	74.1
8532	28	0043.2	59.1
8545	29	0138.1	72.9
8557	30	0038.1	57.8
8570	31	0133.0	71.6

AMSAT Newsletter

DX FOOTNOTES

By: Gus M. Browning, W4BPD
Drawer "DX"
Cordova, SC 29039

I was reading an article a few weeks ago that said the new 11 year sunspot cycle had already started. We all hope this is true I am sure because it will mean DXing will be a little easier. I guess it will start off gradually and slowly build up, maybe taking a few years before conditions really get "hopping" again. Band conditions will be watched very carefully to see if they are really going to get any better. We will all see about this. Can you picture the QRM when the sunspots really open up the bands?The following DX has been worked in conditions not considered good: VK2ZO/C21, 3D2CC, P29PK, A3HFX, H35FX, KA6AX, TB7AAU, JT1KAA, 3B8DA, HG8U, FO8DY, TA2SC, AP2ED, 7Q7DW, 7P8AY, 4W1AF, JT1AT, 9X5AB, A51PN, VE6CB/SU, CR8AB, AP2KS, CR4BS, RH6IEG, JY3ZH, RAØIWH, 9V1RV, 4W1GM and many more. I want to hear 20m when those sunspots get "right," it should be very interesting" to hear rare DX QRMing rare DX!

Any of you who happen to have a good (black and white preferred) photo of rare DX stations please send it to me for use in this column. My supply of really good photos is just about non-existent. Photos of DX operating positions and antennas, etc., are what most fellows would like to see.

I have been trying my best to get a complete list of every "DX spot" (islands, provinces, oblisks, enclives, states, neutral zones, etc.) in the world and have found it to be quite a task. Even when it looks complete I know many places will be overlooked. When the "Super WTW" list is printed I will leave plenty of blank places for additions as they turn up. The WTW standard list will be included in the sheets, being marked with an *, the sheets can be used for either regular WTW or the new Super WTW Award. I will let you know in this column when the all new sheets are printed and ready to be mailed out.

I mentioned some months ago how to make a "line-voltage" booster to overcome the brownouts that may occur here and there, (low line voltage is called a "brownout, in case you didn't know!). I received far too many inquiries to personally answer via mail (my time is used up here). The problem is so simple that an article on how to do the job is not necessary. Just measure your line voltage, subtract that from, let's say, 117 (the voltage you want) then select a filament transformer that will deliver that many volts plus a little because this transformer will have on its primary the brownout voltage, use one that will deliver enough amperage for your needs. Plug this filament transformer into your brownout voltage ac line, then connect the secondary (the filament winding) in SERIES with your rig, if this reduces the voltage to your rig, just turn over the ac plug on your "boosting" transformer and the voltage will then increase instead of decreasing. You can connect any number of these filament transformers up to get more voltage. Connect the primaries all in parallel and the secondaries in series. (Polarized to boost voltage, of course.) Now is this simple enough for everyone? Let me know if it is not, please.

Any of you thinking of going on a DXpedition, give it a lot of thought and keep in mind that propagation is not at its best, expenses are quite high overseas (a lot more than they used to be), allow at least 20% extra for "unknowns" to pop up, because they most certainly will, and then if it still looks good to you, go ahead with your plans and good luck to you. As for myself. I am now laying low to see what the future holds for me. I want one more crack at being rare DX for a few months or maybe even longer, but I do want propagation and the necessary finances.

I wonder if anyone would like to drop me a line telling me of anything they would like me to discuss or write about in this column? I am always wide open for your suggestions.

Any DX station that has no USA QSL manager is overlooking the easy way to QSL (cheapest way too). Plenty of USA stations will take up your QSL chores and I will be very glad to assist you in finding a QSL manager. This is not a problem.

DX stations, DXpeditions, please remember that many USA stations cannot call you below 14275 kHz, and they would like the chance to have a crack at working you. Try tuning 14275 up every now and then. If you want to select them even better, try tuning "up and down" from 14275. You will hear fellows you have never heard before, and they will thank you for being so considerate of them, and THEY WILL BE HAPPY!

I am still QRX for a few very "simple articles" on these little ICs! I would like to see an article showing a number of diagrams on how to connect various types to ÷ by 2 right on up to ÷ by 16, all numbers from 2–16, especially such numbers as 7, 9, 11, 13, 14 and 15. I am sure if I got every article ever written on the 7400 series I probably would find most of what I want to know. I spent two nights rounding up every article on those ICs and yet still nothing on the odd numbers I really wanted to know. I have an 18 position four deck switch that I want to use, with each position dividing by whatever it is set on e.g., position 9, ÷ by 9, position 13, ÷ by 13, etc. I don't care how many 7400 series ICs it takes, they are cheap enough. The articles should be written so that a fellow doesn't have to be a computer expert to understand it.

If you want to hear a lot of very good and at times rare DX, park your dial on 14331 kHz while you are fooling around your shack (with the "system" on the speaker). Of course, you will hear a lot of very common stuff most of the time, but, be very patient and sooner or later the "good stuff" will show up. It seems as if a lot of the DX stations like to "mix it up" with the gals now and then (who doesn't – hi).

The best way to work DX is to do a lot of listening and very little yak. And listen to the DX stations instructions. When they say W2 they mean just exactly that and not W4 or W7 etc. It doesn't take a big fancy antenna and a "big gallon." It just takes a little common sense and a little know how. You can do it too.

Liberia has a new prefix – A8; Burma – AP2KS has in the works a trip there, and has requested a license and hopes to put this spot on the air. Good luck Ole Buddy on this one, they wouldn't let me even get off the plane in Rangoon.

South Yemen (Old Aden – VS9). AP2KS has also applied for a license to operate from this, now rare spot. I suggest you watch the 73 Hotline for full info if it comes too fast for this column.

Tibet and Zanzibar have been removed from the DXCC list as of June 1, 1974. QSOs with Tibet will count towards China and Zanzibar will count for Tanzania. When someone operates from Kingman Reef it will be added to the DXCC. You take two backward and one forward. WTW will still keep Tibet and Zanzibar as separate countries plus we will add Kingman Reef – 3 steps forward.

I hope all of you answered the questioneer sent out by DXAC a few months ago. It was a good chance to "have your say" about countries, etc.

I guess this wraps it up for this month, see you next month fellows.

73 es DX,
de, Gus BPD

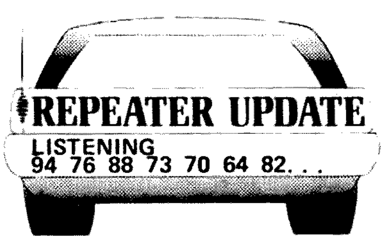
73 REPEATER ATLAS REGISTRATION

REPEATER CALL (WR only)	FORMER CALL	LOCATION (City)	STATE

INPUTS	OUTPUTS	TT Wh TB PL	FM AM RTTY	AUTO PATCH	ERP	
		Hz				USEFUL RANGE (RADIUS)
		Hz				
		Hz				EQUIPMENT
		Hz				☐ SPLIT SITE
		Hz				ANTENNAS & HEIGHT ☐ DIPLEXER

REPEATER GROUP/SPONSOR	TRUSTEE	ID—TYPE OR MFR.

☐ I certify that I have received no outside assistance while completing this form.		
DATE	SOURCE (NAME/CALL)	SPECIAL OR EMERGENCY FUNCTIONS



AL	WR4AEJ	Birmingham		6.28-6.88
AL	W4MWF	Montgomery		DELETE
AL	WR4AGA	Mt. Cheaha		6.10-6.70
AZ	WR7ACK	Sierra Vista		6.18-6.76
	Formerly: WA7KYT			
AK	WR7ACT	Eagle River		6.16-6.76
DE	WR3ACV	Wilmington		7.75-7.15
FL	WR4AEG	Melbourne		443.8-448.8
GA	WR4AED	Stone Mountain		6.16-6.76
	Formerly: W4BDC			
MI	WR8ACF	Detroit		6.04-6.64
	Formerly: K8VLN			
MI	WR8ABI	Oshtemo		6.19-6.79
	Formerly: K8TIW			
MT	WR7ADN	Bozeman		6.28-6.88
	Formerly: W7YB			
NY	WR2ADW	Utica-Rome		6.34-6.94
	Formerly: K2GVI			
OH	WR8ADQ	McConnelsville		6.22-6.82
SC		Anderson		6.22-6.82
SC	WR4AFX	Charlestown	T1.477	6.34-6.94
	Formerly: WB4QGK			
SC	WA4MPC	Columbia		DELETE
SC	WR4AGM	Florence		6.37-6.97
SC	WB4PUP	Greenville		DELETE
SC	WR4ADP	Pickens		6.40-7.00
TN	W4BS	Memphis		6.22-6.82
				444.00-449.00
TN	WR4ABS	Memphis		6.19-7.51
	Formerly: WA4HBY			
TN	WR4AEX	Memphis		6.34-6.94
	Formerly. K4BN			
TX	K4DVJ	Dallas		6.25-6.85
VA		Barren Springs		6.07-6.67
VA	WR4ADV	Charlottesville		6.28-6.88
	Formerly: WB4KNX			
VA	WB4QEP	Danville		DELETE
VA		Galax (Briarpatch Mt.)		6.43-7.03
VA	W4GCE	Lynchburg		DELETE
VA	WB4HCX	Lynchhurg		DELETE
VA	WR4ADY	Lynchburg (Forrest)		6.34-6.94
VA	WB4QEO	Richmond	T1.336	6.34-6.94
VA	WR4ACL	Staunton		6.37-8.97
VA	WB4QFF	Tyson's Corner		6.31-6.91
VA	WR4AGT	Winchester		6.22-6.82
WV	K8SXD	Huntington		DELETE
WV	WR8ABY	New Martinsville		6.34-6.94
	Formerly: WA8ART			
WI	WR9ACD	Fon Du Lac		7.69-7.09
WI	WA9AYR	Green Bay PL	T1.8	6.28-6.88
				7.72-7.12
WI	WR9ACR	Plymouth		7.84-7.24
	Formerly: WB9FXS			
WY	WR7ADK	Laramie		6.34-8.94
				6.76-6.94
	Formerly: WA7EGK			
BERMUDA				
	VP9BA			6.34-6.94

UPDATES NEEDED

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you are interested, send *73* your name, address and phone number. Don't be bashful – remember, it's always easier when you have someone to give you that added bit of confidence.

73 would appreciate amateurs and clubs looking this list over and helping whoever they can. Do you remember when you needed help?

Aaron Jackson Jr.
P.O. Box 123
Clinton NC 28328

James D. Guy K7UAN
5818 S. 21st Dr.
Phoenix AZ 85040

Robert Bryan
P.O. Box 71
Cockeysville MD 21030
Telephone: 301-666-8453

Bishop L. Ellison
P. O. Box 631
West Branch IA 52358

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SELL: Drake TR22 3 months old mint condition. Cables, nicads, case 52/52, 94/94, 13/73, 16/76, 34/94, 72/12. Joseph Reed WB9JXU, Route 1, Mountain WI 54149.

HALLICRAFTERS SX-111 receiver, 80-10 meters, product detector, notch filter, .5–5kHz selectivity. $100 or nearest offer. David Lindey, Box 708, USNSGA, FPO NY NY 09518.

WANTED: Complete Collins S-line; Ken WA5JJB, P.O. Box 355, Nederland TX 77627. Phone (713) 722-4196.

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MITS 908M Calculator w/p.s./case ($143) new	$ 90
Vanguard Scaler – by 10 to 200MHz ($120)	$ 75
Regency 16ch scanner TME-H-LMU ($300) new	$ 245
SBE Scanvision, complete, like new ($900)	$ 500
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uladding Hi-Scan 8ch scanner—tested ($180)	$ 89
Motorola KW 2m amplifier—used	$ 350
Heath IC-2009 calculator brand new ($92)	$ 88
Signal One CX7-A—tested—perfect—like new fantastic	$1990
Kenwood Twins—tested—like new ($900)	$ 750
Concord video monitor VM-12 tested ($408)	$ 250
Concord all channel TV tuner Dem-911 ($600)	$ 250
Regency 450 MHz scanner—($200)—like new	$ 140
Varitronics PA-50 2m amp ($110)—brand new—10w in 50 vout	$ 75
HP tone burst gen—5 freq—T9-5—exc ($37.50)	$ 25
Hitachi stereo cassette recorder—exc—($120)	$ 75
Hitachi AM-FM cassette recorder—exc—($90)	$ 50
Antenna Spec rubber ducky antennas HM 4 2m	$ 4
Radio Shack Code cassette—new ($8)	$ 4
Regency HR-6 ($240) six meter 10w xcvr 12ch	$ 199
Regency ACT-R8H/L Scr ($160) VHF/UHF 8ch scr receiver	$ 136
Standard SR-C826MA ($398) Latest model 10w 12ch 2m xcvr	$ 339
Regency HR-2MS ($319) 2m 15w xcvr with 8ch scanner	$ 269
SBE SB-450TRC ($180) 450 MHz transverter	$ 149
SBE SB-1PA ($190) 10w in 40w out power amplifier 2m	$ 159
Regency Pocket scanner 4 channel ACT-P4H ($120)	$ 99
Cobra 220 MHz Transceiver 10w 12ch ($300)	$ 255
Amphenol RG-8/U Polyfoam 100' w/PL-259 connectors ($24)	$ 19
Standard 14U 2m 22ch superfantastic rig, VOX ($510) demo	$ 439
Pacificom 2m HT—brand new—($250)	$ 199

All Prices fob: UPS collect.
73 Magazine – Peterborough NH 03458

FOUNDATION for Amateur Radio Annual Hamfest Sunday, October 20, 1974 at Gaithersburg Maryland Fairgrounds.

SELL: Drake TR4, AC4, MS4 Speaker, Heath HD-10 Keyer, HM-102 Wattmeter, HD-15 Phone Patch, Eico Model 460 DC Wide Band Oscilloscope 2KW Linear Homebrew. All Mint, Best Offer. Knud E.M. Keller c/o 73 Magazine, Peterborough NH 03458.

HERE IT IS – Heathkit 10-105 – still in the box unassembled. List $400 – our sensational price $379.00. 73 Magazine, Peterborough NH 03458.

TELETYPE EQUIPMENT For Sale: Models 14, 15, 19, 28, 32, 33. TD's, Reperfs, KSR's, ASR's. Parts or complete machines. Write needs and send SASE for complete listing and prices Larry Pfleger, 10615 W. Ridge Rd., Apt. 54, Hales Corners WI 53130.

MIX PLEASURE with pleasure at the Hamburg International Hamfest on September 21. For information contact Lin Brownell WB2HCL, 210 Buffalo, Hamburg NY 14075.

AUTOMATIC TELEPHONE Answering Computer. The best available. List $239.95. I have two new and still in boxes for $150.00 each. Warranty is still good. First check takes one or both. WB8CTA, 1000 Moore Road, Conway MI 49722.

THE ORIGINAL FM Hamfest Sunday August 4, 1974, near Angola IN. Free flea market, entertainment for ladies and kids. Picnic grounds, campsites, boating, food, soft drinks, available rain or shine. For information contact: Fort Wayne Repeater Assoc. Box 6022, Fort Wayne IN 46806.

DANVILLE HAMFEST at Douglas Park in Danville IL on September 1, 1974. Take Bowman Avenue Exit off 1-74 and follow the signs. Prizes will include a low-band rig and VHF gear, antennas, electronic keyer, wattmeters, SWR bridges, and many others. Camping and motel accomodations nearby. Food and plenty of parking available. Huge flea market and commercial displays. Tickets are $2 or three for $5. Advance tickets available from Dave WA9PDS, Dolan Rd., Catlin IL 61817. Send check or M.O. and SASE. Talk-in on 22/82 and 94 simplex.

WYOMING RANCH LAND. No QRM-QRN. Wild horses, antalope, deer. 10 acres – $25 down, $25 month. Owner – Michael Gauthier K6ICS, 9418 Florence, Downey CA 90240.

MOTOROLA PORTABLES – Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal Services, 6663 Industrial Loop, Greendale WI 53129.

BUY-SELL-TRADE write for monthly mailer, give name, address, call letters. Complete stock of major brands new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc. SSB & FM. Associated Radio, 8012 Conser, Overland Park KS 66204. 913-381-5901.

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding. Literature Estes Engineering, 543-A West 184 Street, Gardena CA 90248.

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SARA HAMFEST Sunday August 11, 1974. Riverside Park Murphysboro IL. Tickets $1, 3 for $2. Write Wm. Johnson, 502 W. Kenicott, Carbondale IL 62901.

FREE BARGAIN Catalog. Transistors, relays, ICs, puts, LEDs readouts, resistors, capacitors, thermocouples, transducers, circuit boards, unique components. Chaney's, Dept. A, Box 15431, Lakewood CO 80215.

HANDIE-TALKIE 2m, 5 channels, 2.2W, with external speaker/ microphone, case and spares, Repco 8TN1H55KM. S250.00. WB6UMJ – call (714) 870-6829.

TRADE COMPLETE collection 73 Magazines in 73 binders for either SB-610, SB-620, SB-630 in good condition. K4PNJ/5, 2321 Shadywood Drive, Forrest City AR 72335.

NOW PAYING S1750.00 and up for 618T/ARC-102 S1200.00 and up for ARC-51 – %1500.00 and up for GRC-106, also parts for these sets. D&R Electronics, R D. #1 Box 56, Milton PA 17847 after 6:00 (717) 742-4604.

WARREN HAMFEST, largest family style hamfest at the East. Sunday, August 18th, at Famous Yankee Lake Park. Giant fleamarket, swimming, picnicking: all free. Details, QSL W8VTD.

WANTED: RCA CMCT 30. Also, G.E. 2m progress line base and manuals for them. Patrick Butler, 5110 Willard Rd., Peoria Heights IL 61614.

F.R.R.L. HAMFEST– September 22, at beautiful Phillips Park, Aurora IL. Picnicing, Zoo and Gardens for the whole family. Talk in on .94 and .52. Mail S1 advance donation with SASE to WB9HYH, President, 1888D Carnation Ct., Aurora IL 60506. Drawing #1: HR-2b, #2: ACT-R10H/L/U and many others. Will ship U.P.S.

CALL LETTER LICENSE PLATES – still being collected by 73 Magazine for possible cover use. Please send in an old call letter plate -- most treasured are out-of-district plates such as W2NSD/NH, etc. Got any real oldies? 73 Magazine, Peterborough NH 03458.

VERY INTERESTING! Next 5 issues $1. "The Ham Trader," Sycamore IL 60178. (Ask about our ' HAM EQUIPMENT BUYERS GUIDE" covering receivers, transmitters, transceivers, amplifiers 1945–74. Indispensable!)

JIG SAW PUZZLES wanted. If you have any old wooden jig saw puzzles in your attic - or run across them at an auction (the go for 25¢ usually), please keep in mind that Wayne Green collects them and might even pay a buck apiece for them. C/O 73 Magazine, Peterborough NH 03458. Wood, not cardboard -- and complete.

REGENCY Scanner ACT10H/L/U, new in sealed carton (extra Father's Day present) – $135. TRC-8 and AN-TRC-19 220MHz gear also. Carpenter K1TGE, Parmenter Rd., Hudson MA 01749.

HAMFESTERS 40th annual Hamfest and picnic, Sunday August 11, 1974, at Santa Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of Chicago). Exhibits for OM's, XYL's. Famous Swappers Row. Information – contact, Vince Pronites WA9EOM, 7206 So. Damen Avenue, Chicago IL 60636. Tickets write – Jos. Paradyla, WA9IWU, 5701 So. California Ave., Chicago IL 60629.

NOVICES 75W monoband transceivers 80-40 or 15m only S59.50 75W tribanders 80-40 and 15m only S89.50. Unconditionally guaranteed. Fully expandable into general when you get general class license. Get on the air immediately. Send for free literature Hermes International, Box 989, Floral City FL 32636.

WANTED: General Class (or higher) hams to join 4,500 member Morse Telegraph Club. Hundreds of hams already belong. Send modest S3 annual dues (includes subscription to great slick paper newspaper, "Dots and Dashes"), to GST A.J. Long, 520 West Schwartz St., Salem IL 62881 for membership card and assignment to nearest chapter.

TRADE Collins R-390A/URR excellent, cabinet and complete set cables and tubes. Want synthesized 2m FM xceiver or complete SRC-146A and amplifier. Will ship. T. Fleming, 5019 W. 29th, Little Rock AR 72204 (501) 664-3498.

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

From WA7ECY. . .worked KL7IBG in Ketchikan twice, Hank was in from 0251 to 0648 C.U.T. with signals at times peaking 10 over. Most contacts during this period were into California and Arizona. Scott says the band was in excellent shape in other directions too with contacts made during the same period into Iowa and South Dakota. "Most of the months (May) DX was concentrated to the southern half of the U.S. Nothing much to the Midwest or East coast and New England. Most of us in Oregon need W1 contacts for WAS. So far things have been slow and not too exciting." I am sure many of you would disagree with Scott's evaluation in view of the above.

Joe WB4OSN, says Florida has had some good openings to the West coast with W6ANN, WA6MHZ, K6ODV, K7PXI and K7TLO worked with nice signals. "On the morning of the 25th, while sitting and drinking coffee with Bob W4GDS, we listened to a fantastic opening to the West coast and Puerto Rico. The California stations were 40 to 50dB over as were the KP4's. We worked W1OOP/KP4 who had a 5-9 signal while running on TWO Watts." Joe says he has heard several stations say they did not have an address for KZ5OO and passes along the information. Send your QSL (with 1 or 2 IRC's) to Don KZ5OO, P.O. Box 2097, Balboa, Canal Zone.

Art WA1EXN, has his Laporte Rhombic up and estimates 27dB gain. The 249.93m (820') of wire is mounted on seven push-up TV masts and fed by 68.58m (225') of Belden #8290 twin lead to a balun at the transceiver. The whole thing is pointed at Boise ID with a slight overlap on Montana and Utah, the other states Art needs to complete the 48. Es have not been too great at this time of writing but expectations are high for June and July.

Another group formed to promote 6m is the SIX-SIX Club, Inc., with headquarters in Indiana. Contact the Secretary/Treasurer, Ted Winkel WB9AHJ, 607 East Street, Madison IN 47250 for an application form and further information. The club has over 100 members in seven call areas and publishes a newsletter which is available for an SASE.

Ray K5ZMS, reports SMIRK is over the 300 mark with members in 37 states and 10 countries. I am sure anyone even slightly active on the band is aware of the interest and activity the SMIRK organization has created. Ray requests that check and money orders sent with membership applications be made out to SMIRK rather than to him and mentions also that it is not necessary to send a QSL. Ray will be more than happy to QSL from Texas for those who need it but the QSL work load in addition to the membership certificate work is getting the best of him.

Ted WA9FEF, of SPESM says the three organizations mentioned above are forming a council to coordinate the programs of all three in order to better accomplish their common aims and invites similar organizations to join in their efforts to increase band occupancy, eliminate TVI and in general make 6m a better band.

WAØABI

SOLID STATE NEWS

In a recent editorial Wayne asked if there was anyone out there in Hamdon who would like to write a solid state column for us. The result: We were inundated with sample columns. Our minds were boggled and we couldn't reach a decision on which column to run. So we've decided to let you make the decision for us. Here are two columns. Next month we'll run more. Write and tell us which column you liked the best. We'll tally up the results and use the column that gets the best reader response.

William J. Vette K6TXR

Besides the well known advantages of life in California — anyplace in California — life in the San Francisco Bay area (southern peninsula) has many special advantages for anyone interested in the fantastic development of solid-state electronics. The Santa Clara Valley is now known the world over as "Silicon Valley." In the cities of San Jose, Santa Clara, Sunnyvale and Cupertino you will find the plants of most of the solid state manufacturers of the world, and fascinating new developments are practically everyday occurances.

Each month I will brief you on what new products the various manufacturers have announced.

Quad Op Amps And A Synthetic Transistor

To lead off, I called Art Fury WA6JLJ, the Linear Products marketing manager at National Semiconductor, to see what was new with them. I expected to hear some more about their new series of quad op amps (the LM139/LM239/LM339 quad comparators and the LM124/LM224/LM324 and LM3900 op amps). The last time I talked with Art he was quite excited about the advantages of these new ICs. The chips in this series each consist of four independent operational amplifiers or comparators, with numerous advantages over most previous op amps. These quad devices are made to operate over a wide range of supply voltages (2-36Vdc) from a single voltage source, or from separate positive and negative supplies such as are required by most other types of op amps. These chips feature very low current drain, extremely low bias current, and the output is fully compatible with TTL, DTL, ECL, MOS and CMOS logic systems. All in all, an extremely interesting lot of chips, with numerous applications to ham uses such as active filters, oscillators, pulse generators, time delay generators and a host of other interesting circuits. A great bargain, even if you don't use all four of the amps on the chip. The price of the LM3900 is only 75 cents in lots of 100!

That wasn't the device Art wanted to talk about this time. He was all excited about National's new transistor which is not a transistor. The LM195/LM295/LM395 is an IC which pretends to be a PNP power transistor — and an FET, at that! The masquerade is so complete as to include packaging in a standard TO-3 transistor case, with a pair of pins for base and collector connections. The emitter is connected to the case and will be grounded in most applications. The LM195 refuses to act like a transistor, however, in one important characteristic — it is practically indestructable Excessive voltage will destroy it, but it incorporates complete overload protection; current limiting, power limiting and thermal overload protection are all included on the chip. Those of you who are accustomed to thinking of transistors as "3-legged fuses" will have to find another description for this one.

The device will deliver load currents in excess of 1A, and can switch 40V in 500ns. Its high input resistance makes it a very handy transistor for use as a high power op amp, and it has numerous other applications to circuits of interest to us hams. It can be handily applied to variable from about 4—35V at an amp of current, or to a high current solid state relay, or any other circuit where you need an indestructable 1A transistor. Since the high impedance input allows long time delay circuits with reasonable values of capacitance and resistance, I am going to put the LM395 to use in a photo timer circuit. The LM395 goes for about $7.50 in single unit quantities, and about $4.95 each in lots of 100.

Temperature Transducer

Another fairly new National IC I was able to get some data for is the temperature transducer IC, the LX5600AH/LX5600H or LX5700AH/LX5700H. This chip, in a TO-5 package, includes a linear temperature sensor, an amplifier and a stable voltage reference. The output of the chip is a temperature reading, in degrees Kelvin, over a range of -55°C — 125°C ±4°C. The current price of this chip (around $40.00) will have a limiting (or should we say cooling) effect on ham interest in it, but it is predicted that within a year the price will be down to a figure which will have us all designing indoor-outdoor thermometers, pyrometers and all sorts of other interesting temperature measuring devices.

For additional information, prices or applications of any National semiconductor products just drop a line to the advertising department, *National Semiconductor Corp., 2900 Semiconductor Drive, Santa Clara, CA 95051.*

Improved Function Generator

Among the new products at Exar Integrated Systems in Sunnyvale CA is an improved function generator IC, the XR2206/XR2306. This is an evolutionary development based on the XR205 function generator which Exar introduced some time back. The XR2206/XR2306 does a much better job than the XR205, and the XR2306 will probably sell for less money. Sine wave output of the XR2306 (the "industrial" and lowest priced version) exhibits less than 3% distortion without adjustment and can be adjusted to give less than 1.5%; the XR2206 is an order of magnitude better (2% and 1% vice 3% and 1.5%) but sells for about 2½ times as much. Square, triangular and sine waves are available from these generators, at frequencies up to slightly more than 1MHz.

A function generator kit, consisting of a PC board and two XR2306 ICs (one for the function generator and the other for a modulator) will be available soon from Exar for about $12.00.

For additional information about these or other Exar Products, write to *Leonard A. Greene, Product Marketing Engineer, Exar Integrated Systems, Inc., 750 Palomar, Sunnyvale CA 94086.*

K6TXR

Jim Trulove WB5EMI

In this fascinating world of electronics, new solid-state devices are being introduced almost as fast as they can be conceived. Keeping up with new developments can indeed be a very time consuming job. IC complexity is increasing, as are gain, frequency response, and power handling capabilities of discrete transistors. Whole technologies are being born virtually overnight, accompanied by a myriad of "alphabet soup" anachronyms — CMOS, MNOS, ECL, I^2L, VLSI, PMOS, EFL — the list goes on and on. While not all of these technologies impinge directly on the amateur radio community, a fair majority will eventually find their way into our circuits.

What we modestly hope to do in this space each month, is give you some introduction to new solid-state developments that appear to be of ultimate use to hams. For those of you that avidly experiment with your own circuit designs, this column should give you a head start on the latest new devices. Others will have

the opportunity to become conversant with new technology as soon as it arrives on the electronic scene. General principles and characteristics of solid-state developments will comprise the bulk of material. Detailed designs and specific circuit applications for the new devices will be covered in the format of complete articles.

We'll start by covering a few specific developments in integrated circuits. As you may have noticed, the traditional dividing line between digital and linear (or analog) is waning thin. Not the least of the new progenies of the digital world is a new dual voltage-controlled oscillator (VCO) in Texas Instruments' Schottky TTL line. Dubbed the SN74S124, the VCO can be varied from -35 to +75% of the nominal center frequency set by a fixed capacitor. The center frequency can be anywhere between 0.12Hz and 85MHz. The foremost feature of the VCO is a frequency range input which allows the oscillator frequency range to be varied from ±1% to over ±100% of the center frequency. Further, a synchronous enable input allows you to turn the output pulses on or off in as little as 70ns. The circuit can be crystal-controlled and is available in a 54S military version for precision work. This is one circuit that should find immediate application in phase-locked-loop frequency synthesizers, FSK generators and manual VCOs. It has a high enough frequency range to be used to generate direct FM on 6m, or through a x2 multiplier, on 2m. Another handy application might supply a variable 45MHz local oscillator injection for your 2m receiver. Best of all is the price – under $4.50 in singles. Check with your local TI supplier.

Another new type of linear/digital device that is making waves is the CMOS analog switch. In the analog switch, the series resistance, drain to source, of a MOS transistor is varied by a control voltage input from an "on" low of about 300Ω to an "off" high of several megohms. The switching can take place quite rapidly, thus making an ideal analog multiplexer. An example of this type of IC is RCA's CD4016 QUAD Bilateral Switch, which can handle a 15V peak-to-peak signal at switching rates to 10MHz. Siliconix makes a pair of similar devices, the DG200 Dual SPST Switch and the DG201 QUAD SPST Switch. Any of the control inputs may be ganged to yield up to a 4-pole switch. Gain control is possible by varying the control voltage.

Analog switches and multiplexers can be used to advantage to mix or alternately inject different signals into a common output path. One typical application might be a logic controlled audio mixer for a repeater, bringing together code or voice ID, time announcements, and receiver audio, perhaps from several receivers in a voting-scheme.

A new solid-state technology, charge-coupled devices (or CCD's), is beginning to challenge conventional vidicons and orthicons in miniature TV cameras. The CCD image-sensing arrays being developed by Fairchild Semiconductor utilize a multiphase clock signal to transfer charge packets off the chip. Individual charge packets are proportional to the amount of light falling on each sensing element. The technology was originally introduced with a linear 500 element sensor, and has recently been joined by a 100 x 100 area sensor array, the CCD-201. The 10,000 silicon photosensor elements are in a 4:3 aspect ratio and require only 50mW from a 20V supply. Fairchild has constructed a television camera with the CCD-201 that is about half the size of a pack of cigarettes! Since the device is already digital in nature, it lends itself rather well to slow speed scan conversion. This should be great news for slow scan enthusiasts who could scan the array at a slow rate for direct slow scan transmission.

At present the CCD-201 is priced at around a kilobuck, but this should change quite rapidly with volume production. After all, the first calculator chip was initially priced way up there, but chips can now be bought for well under $10.

If you want more information about any of the above new devices, write directly to the manufacturers at the following addresses: *Texas Instruments, Inc., Inquiry Answering Service M/S 308, P.O. Box 5012, Dallas TX 75222; RCA Solid State Division, Box 3200, Somerville NJ 08876; Fairchild Semiconductors, 313 Fairchild Dr., Mountain View CA 94040; Siliconix Inc., 2201 Laurelwood Rd., Santa Clara CA 95054.*

WB5EMI

DX IS AMATEUR RADIO ...EVERYWHERE

There are countries which belong to the ITU and in which the only amateur operation is DXing. And when the one or two or the handful of amateurs in that country turns on his rig, he's DXing.

Take Nepal...9N1MM operated by Father Moran has been the only amateur activity there for some years. Or Sudan...where ST2SA operated by Dr. Sid Ahmed Ibrahim is the only Sudanese station on the air. Pitcairn Island maintains its weekly contact with the outside world through VR6TC operated by Tom Christain. In Cambodia there is XU1AA and XU1DX, in Viet Nam it is XV5AA and XV5AB. These stations are operated by DXers and they are the only amateur activity in those countries. You can check Macao, or Sarawak or Brunei. You can check St. Helena Island and the Falklands and Tristan de Cunha and you will find that DXing is the amateur activity. And in Sikkim, AC3PT the only station on the air there is operated by the prince who rules the country. In Jordan King Hussein signs JY1 and a check of any call-book will show many calls in the Arabian Peninsula countries where the holders name is preceded by 'Prince' or 'King.' In many countries DXing is the only amateur activity and there is nothing else.

There is an International Frequency Conference set for 1979. There will be representatives from member countries of the ITU and among the things that will be discussed will be the amateur frequencies. When a DXer from the U.S. encounters a DXer from another country there, they will speak a common language. But what about the others?

There are those among us in amateur radio who say that DXing has been overblown. That there has been too much emphasis and that it should be de-emphasized. To believe this would be to believe that the one activity that is common to amateur radio in every country that is signatory to the ITU treaties is not an especially important activity and should be down graded.

Perhaps it is felt that the emphasis properly should be on traffic handling. Perhaps at an ITU meeting it would be well to talk of traffic nets and phone patches and those many other activities peculiar to the U.S. It might be well to speak about such things as the National Traffic System and the Transcontinental Net...or the myriad of other traffic nets. It might be well to talk about these but the question must be asked as to whether one would find a responsive ear.

If one talks with someone from without Region II of the IARU, you would be speaking about something that is not legal in most countries of Region I and III. Third party traffic on amateur frequencies is absolutely illegal in many countries which are signatories to the ITU treaties.

So it is DXing which may be the only amateur radio activity which is *common to any member country of* the ITU which allows such amateur activity. There are those who say that OSCAR or AMSAT is the future of amateur radio. If this be true it may

be a distant future for presently amateur radio lacks and probably will always lack the awesome capability needed to put a transponder in earth-orbit. And until amateurs are able on their own to launch their own packages into orbit and to be totally independent of any other agency or activity, there must be some reason to feel that these are parasitic efforts which depend on someone else for an essential part of the effort.

But at the same time DX can be achieved with a simple rig and a simple dipole. It can and it has and it will.

There are some amateurs who get up tight over Citizen Band operators and some of the things they hear on the CB channel. Often they are strong in their condemnations of matters they consider to be extra-legal and improper. One would wonder what might be the reaction of a delegate to an ITU conference from a country in Region I or III when they consider the traffic handling systems that are active on amateur bands within the U.S.

Perhaps the emphasis has been wrong. Take a look at the multitude of amateur station appointments available for traffic work. There is the Official Phone Station and the Official Relay Station. The Phone Activities Manager is a 'leadership' post or organize phone traffic nets and the Route Manager organizes the CW traffic nets. There is the National Traffic System and the various regional traffic systems with official status, and there are the multitude of area traffic nets.

All of these exist. . .and all are devoted to an activity which is illegal on amateur frequencies in most countries of the world. But that activity that is legal everywhere. . .and which is the only amateur activity in many countries that belong to the ITU, that activity is considered in some sectors as 'overemphasized.'

Many are beginning to worry about 1979 and the way amateurs may fare at the allocation of frequencies by the ITU treaties. Many have their own panaceas. . .many of which have been tried before.

Perhaps it is time to consider how amateur activities within the U.S. look to other countries. Each month QST lists over many pages those activities which are illegal over two thirds of the earth. DX plods it way along. . .short on attention and encouragement. But it survives.

DX is Amateur Radio. . . Everywhere!! Can you name other activities which can say that?

There are none.

Hugh Cassidy WA6AUD
Reprint WCDXB

LETTERS

NUDE COVER

I can't say that I was shocked when the June issue of 73 appeared in my mailbox naked, but I was displeased at the battered and folded condition of the cover not protected by the usual brown wrapper. In these many years I have never received an issue of 73 that had been damaged in the mails, and now I find myself buying a newsstand copy so I can have a decent one for the collection. No doubt taken as an economy move, your deletion of this protective cover seems to be a mistake. I'm sure that your staff doesn't like to put together a nice photographic or artistic cover and then have an address label stuck on the middle of it, or have you seen a magazine that has gone through the mails the way we all get it? Please reconsider the brown wrapper as being a small but worthwhile expense.

J.R. Johnson WA5RON
Austin TX 78751

Sorry about that. Nothing to do with economy at all. The only way we could get the issue into the mail during the strike at the printer was without wrapper — and even so it came out two weeks late! This issue should be wrapped again. . .wayne.

HE DOESN'T LIKE US

I did not like the cover of the May issue of 73. I have not liked some of the other issues that tried to be a sex cover magazine. If I want a sex magazine I will buy one. Please get back to HAM RADIO.

Dick Wright

The May cover was not a sex cover. . .ed.

READER DEMANDS

Please be informed that I intend to cancel my husband's subscription unless you show the front of the streaker of your May issue on a forthcoming magazine.

Mrs J. B. Smith
XYL/W6REI

SCOUTS WANTED

An attempt is being made to locate as many Boy, Girl and Adult Scouters that hold amateur radio licenses for the promotion of Internation Radio Scouting. Would anyone interested please contact me. Thank you.

Don Wibel K9ECE/WI9BSA
5115 Delaware Ave.,
Fort Wayne IN 46805

WHY NOT MORE FIELD OFFICES

I was reading the aritlce in June's 73 by W6HEC concerning paying $9 for re-application of a ham license. Well at the present time I am a novice, and I don't think I would mind paying the fee if it was put to better use. Why doesn't the FCC establish more field offices throughout the country?

When I was living in Altoona PA, I would have to drive to Pittsburgh — 2 hours each way — so that I could take an exam once every three months. To take it during any week I would have to drive to Philadelphia — 12 hours round trip.

I have just moved to Cleveland OH. I don't have the long drive now, but I can still only take it once every three months, or drive to Detroit MI — about 5 hours each way.

I am sure there are many novices and other hams trying to obtain a higher class license throughout the country who have worse problems than this.

Greg Haines ex/WN3TJU/8
Cleveland OH 44133

The FCC is not unaware of your problem and they are indeed working on a solution. Instead of a handful of FCC offices giving the amateur exams, they are now experimenting with having the Civil Service administer the exams — and this could result in about 1000 examinating offices. A test is now being run with Civil Service offices in five areas to see what bugs develop.

WELL DONE

As a charter member of the "Hate Wayne" fraternity, it hurts me to say, "Well Done!"

First, I don't like to write fawning letters just to get your approval, so I won't sign it (and also protect myself from the IRS Gestapo).

My resistance began to crack, when I realized that, "By golly, he does turn out a good magazine with some good technical articles and not all that crap about contests and clubs, etc."

Then came the diatribes about the IRS and FCC/Walker. I thought that the IRS articles especially had no place in a radio publication. Then I realized that if we let the IRS go unchecked, we won't have any free-

Cont'd on page 106.

P. G. Martin G3PDM
Oak Cottage
Witton Gilbert
Durham, England

SOME DIRECTIONAL WATTMETERS AND A NOVEL SWR METER

Most conventional reflectometers cannot be used for accurate power measurement because their sensitivities are frequency dependent. This is due to the use of combinations of reactance and resistance in the sampling circuits which detect the transmission line current and voltage.

This basic problem can be solved by the use of conventional lumped components instead of the distributed parameters of a transmission line. The line voltage can be sampled by two resistors or two capacitors used as a voltage divider, rather than one resistor and some distributed capacitance.

The line current can be monitored by a properly designed current transformer instead of an inductance and resistance. High frequency current transformers consist of primary and secondary windings on a ferrite or iron dust toroidal core, with a low value of load resistance across the secondary winding.

All SWR bridges and directional wattmeters need to generate two dc voltages proportional to the forward and reflected voltages or currents of the transmission line. To achieve this one has either the current detector or the voltage detector providing two antiphase signals so that addition and subtraction can be performed.

A Frequency-Independent Directional Wattmeter

M. B. Allenson G3TGD, has designed a wattmeter using the above principles, where the low resistance in the current transformer secondary circuit is split into two equal parts. The center connection is taken to the voltage sampling point so that sum and difference voltages are available at the ends of the transformer secondary winding, see Fig. 1.

With two meters, this circuit can be used as a versatile calibrated directional wattmeter over the freqnecy range 100 kHz to 70 MHz, with an accuracy of about 10 per

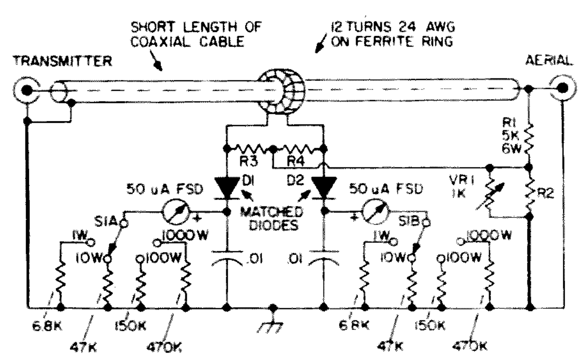

Fig. 1. Circuit of the basic frequency-dependent directional wattmeter due to G3TGD. The two meters indicate forward and reflected powers.

cent. Precise calculations of SWR and transmitter efficiency can be made.

Maximum sensitivity with a 50 μA meter is less than five milliwatts, but with the

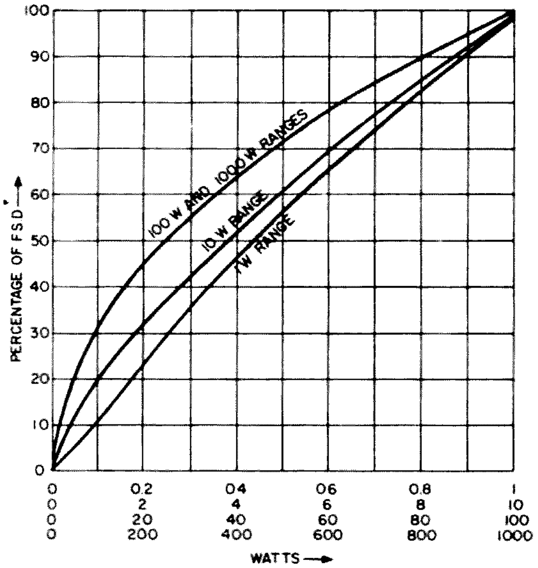

Fig. 2. Calibration curves for the instrument described in Fig. 1.

multiplier resistors specified in Fig. 1, full scale deflection corresponds to power of 1, 10, 100 and 1000 watts. Calibration is non-linear, because the instrument samples voltage, and power is proportional to voltage squared.

Unfortunately, two transmission line impedances are in common use in coaxial systems: 50Ω and 75Ω. As it is not possible

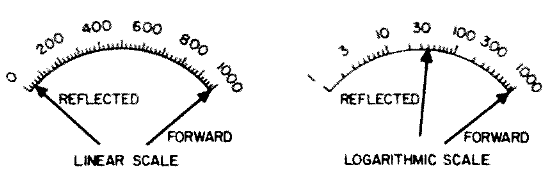

Fig. 3. Linear and logarithmic scales. The inherent advantages of the logarithmic form are immediately obvious.

to design instruments whose sensitivities are independent of line impedance, some component values must depend on the impedance in use. For simplicity, only one of the voltage driver resistors need be changed, but instrument calibration will be different. By changing the current transformer resistors as well as one of the voltage divider resistors, the calibration is the same for both line impedances. This technique has been adopted here, and the calibration curves in Fig. 2, are correct for 50 or 75Ω lines provided the resistor values in Table I are used.

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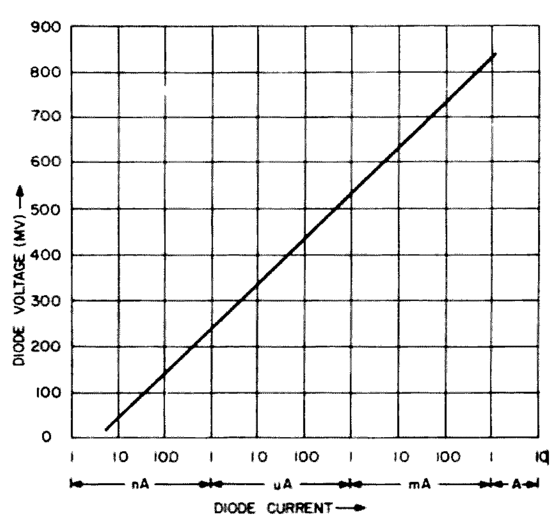

Fig. 4. Smoothed experimental plot of the current /voltage characteristic of a 1N4002 silicon junction diode, showing its logarithmic properties.

The Logarithmic Wattmeter

The basic instrument can be simplified by including a logarithmic network so that the power range switch is redundant and a single meter scale can be used for powers from, say, one watt to 1000 watts. A logarithmic

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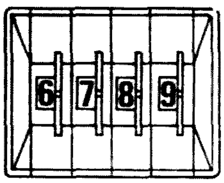

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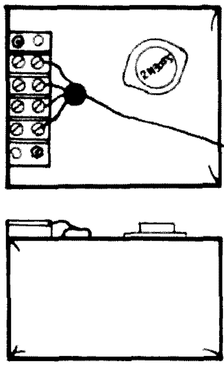

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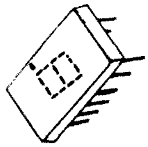

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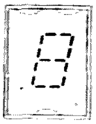

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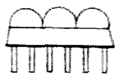

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scale has the 1, 10, 100 and 1000 watt points equally spaced (see Fig. 3).

The advantage of a logarithmic instrument is that one can measure very low reflected powers and very high forward powers simultaneously with the same percentage accuracy, without having to switch meter ranges.

It is simple to add a reasonably accurate *wide-range* logarithmic network to the meter in Fig. 1 (see Fig. 5). The basis of its operation is that the voltage dropped across a forward-biased p-n junction diode is proportional to the logarithm of the current passing through it (see Fig. 4). To reduce the potential dynamic range of the circuit, a relatively insensitive meter is used, and a small resistance is added in series with the logarithmic diode to restore a logarithmic form to the scale (see Fig. 6).

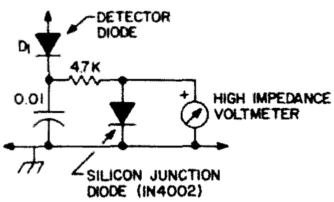

Fig. 5. Basic wide-range logarithmic converter.

An experimental logarithmic wattmeter is shown in Fig. 7. Figure 8 gives the calibration scale for 50 or 75Ω lines, provided the correct resistors are used (Table I).

A Direct-Reading SWR Meter

A particularly useful device would be an instrument giving a direct measurement of the standing wave ratio on a transmission line, independent of the absolute power levels or the frequency in use. Such an instrument, with its single meter, would be ideal for incorporation into transmitters and transceivers (especially with the physically small sampling circuits associated with it).

The swr can be expressed in terms of the forward and reflected voltages according to:

$$\text{swr} = \frac{E_f + E_r}{E_f - E_r} \qquad (1)$$

We wish to generate this function electronically, so that outputs of the two detec-

Table I

	Ω	Ω
Line impedance	50	75
R3 and R4	27	33
R2	220	180

Values for R2, R3 and R4 to be used in 50 and 75Ω transmission lines.

tors can be used to generate a meter current proportional to SWR. This would be rather tedious, though not impossible.

Conveniently, manipulation of equation (1) shows that:

$$\frac{E_f}{E_r} = \frac{SWR + 1}{SWR - 1} \qquad (2)$$

which although not proportional to SWR, is a mathematical function of it only. Electronic division of E_f by E_r is easily done by taking logarithms and subtracting. That is:

$$\log \frac{E_f}{E_r} = \log E_f - \log E_r$$

In Fig. 9, the two silicon diode voltages are proportional to the logarithms of their currents, which in turn are proportional to the forward and reflected voltages. The two diode voltages can be subtracted directly by connecting a meter between them, rather than from each one to chassis.

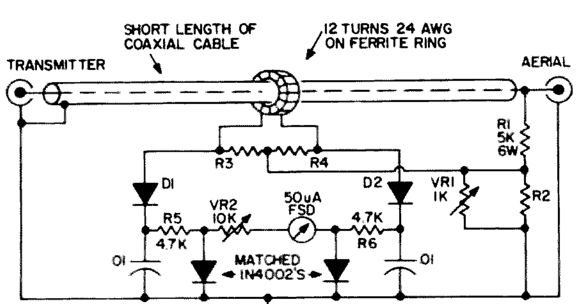

Fig. 6. Circuit of the logarithmic directional wattmeter. D3 and D4 are matched (see text).

The meter cannot be calibrated linearly in SWR, because of equation (2), and because the circuit does not take anti-logarithms after subtracting the logarithms. The outcome of this is beneficial: the SWR meter is increasingly sensitive as the standing wave ratio approaches 1:1. This is where one wants most sensitivity: to make the final

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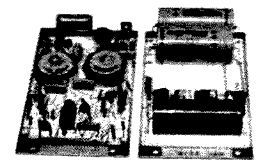

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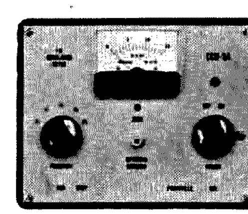

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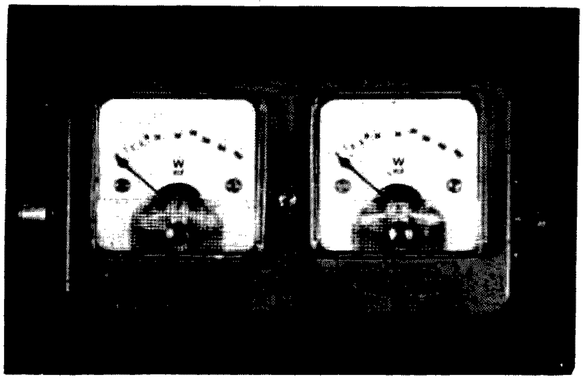

Fig. 7. An experimental logarithmic wattmeter.

adjustments to aerial arrays, to measure the variations in SWR over a band, and so on. Fig. 10, shows a calibration curve for SWR meters. Naturally the meter sensitivity cannot be completely independent of the power level in use. Accuracy falls when the reflected power is less than about half a watt (this corresponds to an SWR of 1.05:1 when the forward power is 1 kW).

A differential amplifier could be added to the circuit of Fig. 9, to enable a less sensitive meter to be used.

Construction of the Instruments

Layout of the sampling circuits is fairly critical, see Fig. 11. The input and output sockets should be set a few inches apart, and

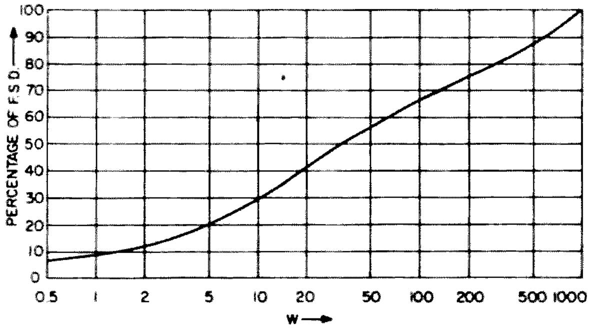

Fig. 8. Calibration curve for logarithmic wattmeters.

connected together with a short length of coaxial cable. The coax braid must be grounded at one end only, so that it acts as an electrostatic screen between the primary and secondary windings of the toroidal transformer. Twelve turns of 24 AWG enamelled wire, equally spaced around the circumference of the ring, form the secondary winding. The primary is formed by simply threading the ring onto the coax.

A suitable ferrite ring is the Mullard FX1596, made in England, although other types are suitable. The FX1596 has an outside diameter of half an inch, and is designed for wideband rf applications between 5 and 20 MHz. The main requirement is that the ferrite material should maintain a high permeability over the frequency range in use.

Other components in the sampling circuits should have the shortest possible leads. R1, R2 and R must be non-inductive solid carbon types; for high power levels (about 100 watts) R1 should consist of two or three 2 watt carbon resistors in parallel. VR1 should be a miniature skeleton potentiometer to keep stray reactance to a minimum, although it may be dispensed with by trying various fixed resistors for R2 until the reflected indication under matched conditions is zero.

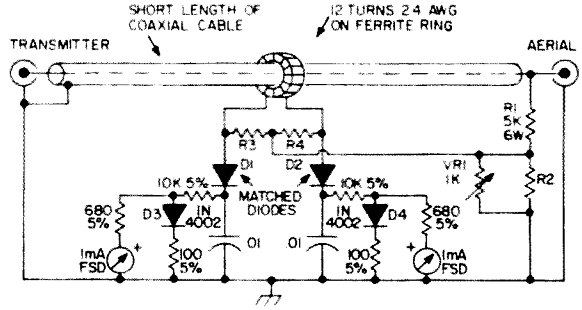

Fig. 9. Complete circuit for a power-independent, frequency-independent direct-reading SWR meter.

The detector diodes need to be matched for similar voltage drop, using the circuit in Fig. 12. Point contact germanium types with a PIV rating of 80 volts or so are recommended.

Logarithmic diodes should be modern medium-current silicon junction types, such as conventional rectifier diodes. The 1N4002 is specially recommended for its good logarithmic properties. Log diodes should also be matched with the circuit in Fig. 12.

The 0.01 μF decoupling capacitors should be a disc ceramic type.

In designing a toroidal transformer different to that specified, several factors should be borne in mind. As the number of secondary turns increases, the self-capacitance rises and causes the response to fall at high frequencies. Failure of this nature causes the reflected power indication to rise; in other

words the directivity of the instrument falls. If the 27Ω resistors are raised appreciably in value, the instruments will eventually become frequency sensitive.

The ratio of the voltage sampling resistors (R1 and R2) in the HF designs is determined by the sensitivity of the current sensing circuit, and the two sampling voltages must be equal in magnitude under matched conditions. VR1 provides fine adjustment of the ratio. Absolute values of the resistors can be

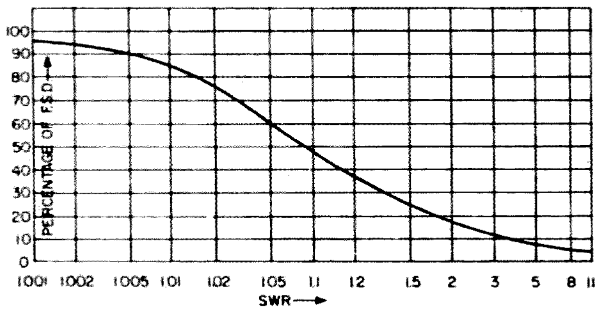

Fig. 10. Calibration curve for SWR meters of the type described in Fig. 9.

varied considerably, bearing in mind that as their values increase the stray capacitance across them may need to be compensated for.

Useful Equations

Let the line current be I amps, the line voltage be V volts, and the characteristic impedance of the transmission line be Z_o. Then $V = IZ_o$.

If the current transformer has a ratio of 1:n, and each of the resistors in its secondary circuit has a value of RΩ, then the rf voltage across each of them is given by:

$$V_{(i)} = \frac{IR}{n} \qquad (3)$$

The voltage detector output is obviously

$$V_{(v)} = \frac{VR_2}{R_1 + R_2} = \frac{R_2}{R_1 + R_2} IZ_o$$

Which is, to a good approximation,

$$V_{(v)} = \frac{R_2}{R_1} IZ_o \qquad (4)$$

The main design equation for all the HF instruments is therefore:

$$R_2 = \frac{R.R_1}{n.Z_o}$$

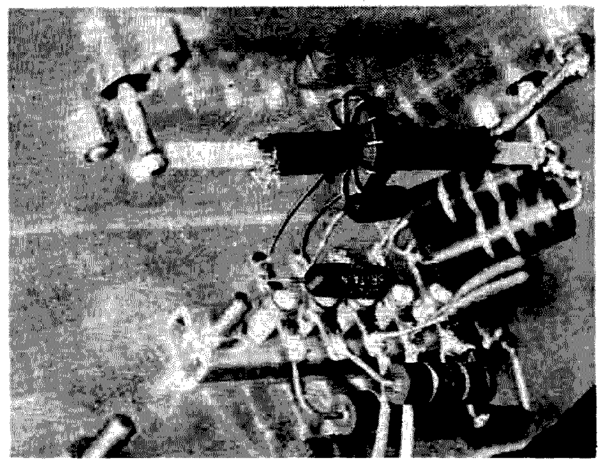

Fig. 11. Photograph showing layout of sampling circuits used in an experimental swr meter.

where the value for R2 includes the effect of VR1, if fitted.

The dissipation of some of the components specified is quite high. For those planning different circuits, the following equations express the dissipation of R1 and the current transformer resistors R:

$$W_{(R1)} = \frac{Z_o.W}{R_1} \quad \text{watts,}$$

where W is the transmitter output power.

$$W_{(R)} = \frac{W.r}{n2.Z_o} \quad \text{watts.}$$

In the instruments described, $W_{(R1)}$ is about 5 watts, and $W_{(R)}$ 2 watts for a transmitter power of 500 watts.

Calibration

If any of the instruments are built exactly as described, and used in systems of the correct impedance, the calibration given in Figs. 2, 8 and 10 will be sufficiently accurate for most purposes. For those designing their own circuits, the following procedure is recommended.

Test equipment needed includes a high power rf source (a transmitter) and an rf voltmeter. The instruments can be calibrated with less accuracy without the rf voltmeter. The wattmeters are calibrated by feeding power through the meter into an appropriate dummy load (50 or 75Ω). VR1 is set for minimum reflected power indication, and the power scale is marked according to the rf

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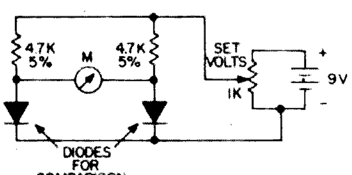

Fig. 12. Hookup circuit for matching detector diodes for equal forward voltage drop, and silicon junction diodes for similar logarithmic properties. The meter should be as sensitive as possible (say 50 μA fsd), and should not deflect appreciably as the voltage is varied between zero and nine volts.

voltage appearing across the load. If an rf voltmeter is not available, a peak-reading type can be made with a diode, capacitor and dc voltmeter. As the detector output is equal to the peak rf voltage applied to it, equation (4) leads to:

$$V_{(det)} = 2.8\ V\ \frac{R_2}{R_1} = 2.8\sqrt{WZ_o\ \frac{R_2}{R_1}}$$

It would be difficult for most amateurs to obtain sufficient high power carbon resistors to calibrate an SWR meter by means of deliberate mismatching. An indirect method is therefore recommended.

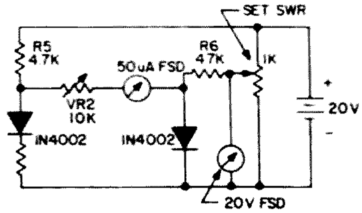

Fig. 13. Circuit used to calibrate SWR meters(see text).

Disconnect R5 and R6, Fig. 9, from the detectors, and connect them instead as shown in Fig. 13. One voltage is fixed at about 20 volts, and the other is varied between zero and 20 volts. The ratio of these voltages corresponds to a definite SWR which can be determined from equation (1). Before carrying out this procedure, however, VR2 should be set for full scale deflection of the meter under matched conditions at the highest power level to be used.

Conclusions

All of the instruments described in this article have been tested under actual operating conditions, on all amateur bands between 1.8 MHz and 30 MHz. Power levels used varied from 100 to 1200 watts. With the components specified, the instruments will sustain power levels well above the kilowatt level for periods of tens of seconds.

It is hoped that by introducing frequency independent directional wattmeters, one will be able to make useful comparisons of absolute power levels and accurate assessments of standing wave situations. The logarithmic scales are an added convenience, and the direct-reading SWR meter offers a saving in meters.

The photographs were originally published in *Radio Communication* and are reproduced here by courtesy of the *Radio Society of Great Britain.*

Supplies of Ferrite Rings

So that constructors of the instruments described above can be sure of best results, I have made arrangements to export Mullard FX1596 ferrite rings from England. The cost of two rings, postage, import duty, etc., is one dollar (dollar bill or check), from P. G. Martin, G3PDM, Oak Cottage, Witton Gilbert, Durham, England.

. . . G3PDM

Bill Hoisington K1CLL
Farover Farm
Peterborough NH 03458

FET ON 450 MHz

This article describes a basic rf amplifier using FETS in the 420 to 450 range. Emphasis is placed on the complete isolation between the input and output circuits, achieved without neutralization. This is a vital requirement for a modern 450 MHz amplifier. Well over 20 dB gain is achieved in this amplifier, with all details of construction and testing methods included here. When RCA says that "these devices are useful to 500 MHz," they certainly tell the truth!

General

We will confine ourselves in this article to two FET devices which are readily obtainable, one is the 3N200 at approximately $4.30 each, and the 40841, at 68¢ each.

The 3N200 units are "militarily tested" so you can depend on them for operation. The 40841 are "batch-tested" and you should test them all in a suitable circuit, rate, and number them yourself. So far I have failed to find one that didn't work well. At 68¢ for a 20 dB plus, non-neutralized amplifier at 450 that's a good value.

Fig. 1, shows the internal wiring detail of both the 3N200 and the 40841. They are alike so you can make up one test jig for

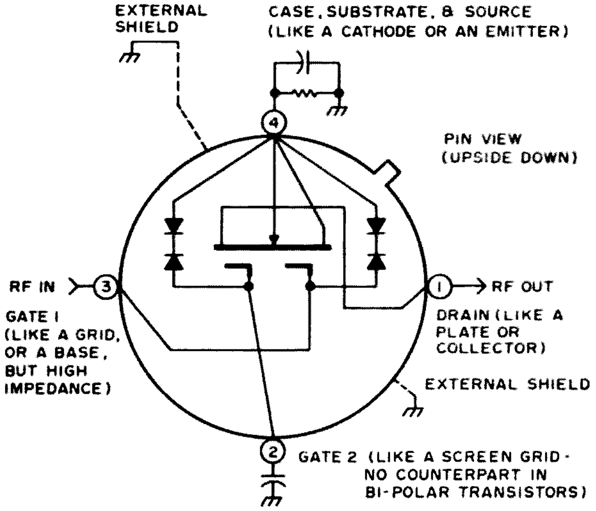

Fig. 1. Basic pictorial of 3N200 and 40841 FETs.

both, at 60 MHz or 147 MHz, as shown in a good *73* article entitled *"Taming Those Hot 500 MHz FETS."* I have turned the usual basing diagram around and added a few external indications so you can see at a

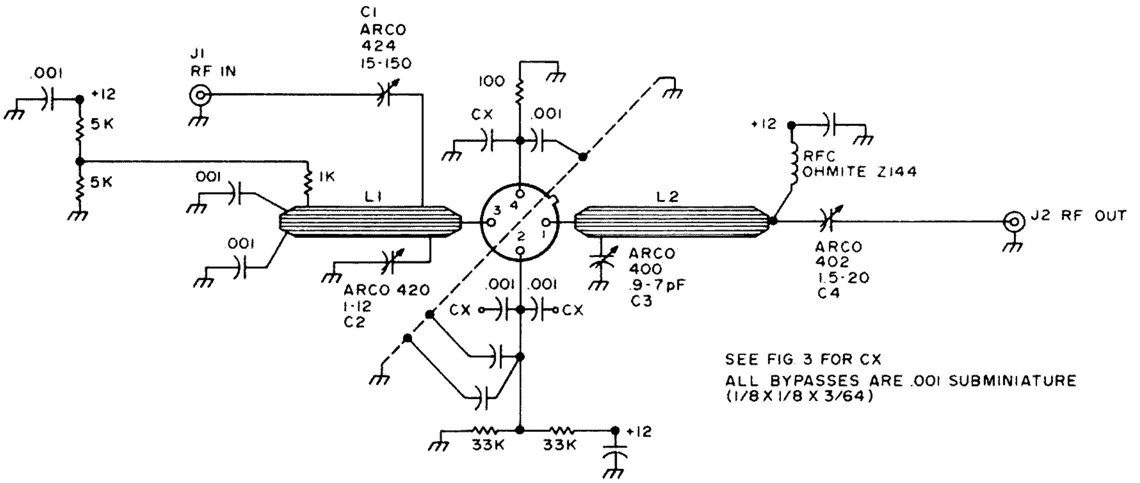

Fig. 2. Schematic, FET amplifier, 420–450 MHz (pin view).

glance what is going on and how to think about it. You will have plenty to do without translating figures. I think the figures in this article, 1 through 6, are clear and have all the details and notes you need for the project.

These devices are "N-channel silicon depletion types, dual-insulated-protected-gate metallic-oxide semiconductor field-effect transistors," if you can say all that in one breath. They have excellent power gain, over 20 dB in this example, at 450 MHz, linear circuit operation, and a wide dynamic operation range. Their square-law characteristics result in low cross-modulation performance over the AGC range, if used. The very low feedback capacitance eliminates the need for neutralization, and reduces local oscillator feed-through to the antenna. Back-to-back diodes protect the two gates from electrostatic charges and act as "transient trappers" for inputs that exceed ±10V. Be careful and don't put 12V straight from the car battery on a gate. I did!

Circuit

Fig. 2, shows the circuit in schematic form, and Fig. 3, shows details of the source bypass capacitor plate labeled "Cx." This special capacitor is very important and is necessary to properly bypass the source and tie it to the groundplane (baseboard) rf-wise. Bear in mind that at 450 MHz, shape is beginning to assume major importance, and as you get closer and into microwaves it is almost the whole deal. The oft-repeated "keep the leads short" is of great importance also. In particular the input (gate 1) and the output (drain) should be connected with careful attention to soldering very close in to the case of the device. Going around the pins on the device as in Fig. 2, pin 1 is the drain (whoever decided to use *that* word?) which is connected to the output circuit L2. Pin 2

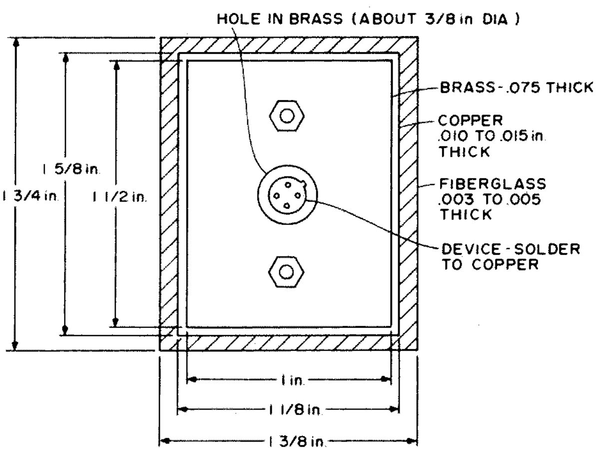

Fig. 3. Dimensions of device mount and capacitor "Cx."

is gate No. 2, serving here somewhat in the same fashion as the screen grid of tubes. Pin 3 is gate No. 1, connected to the input circuit L1. Pin 4 is the source, substrate (like a baseboard inside that little tin can), and the case. It is very important that the source is internally connected to the case, as you will see later. The type of connectors used for input and output matching, the kind of cables, and the equipment used at the other end of both cables all play a part in matching. Granted, the ideal is a pure 50Ω resistance, but you should be that lucky!

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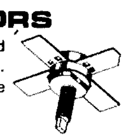

2N5589	3 Watts Out	$ 3.50	2N6080	4 Watts Out	5.00
2N5590	10 Watts Out	6.00	2N6082	25 Watts Out	10.00
2N5591	25 Watts Out	12.00	2N6084	40 Watts Out	15.00

All are Silicon NPN and power output ratings are good to 175 MHZ. Hurry! Some quantities are limited.

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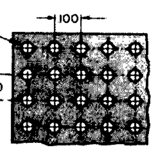

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4231	4½ x 6	1.55	4240	4½ x 6	3.20
4232	17 x 6	5.75	4241	17 x 6	6.70

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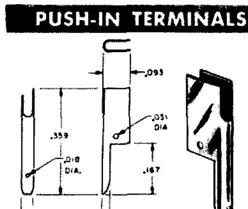
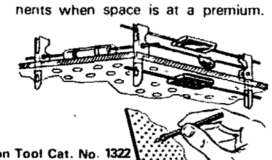


The terminal is easily press-fit into a .042 dia. hole without staking or the base may be flared for permanent installations. Ideally designed for use in micro-circuitry to support components when space is at a premium.



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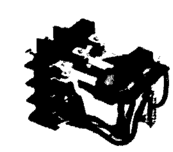

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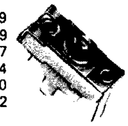
403	.67	423	.64	460	.37	466	.97
404	.81	424	.80	461	.32	467	1.04
405	1.01	425	.85	462	.52	468	1.20
406	1.04	426	1.01	463	.64	469	1.22
420	.58	427	1.12				



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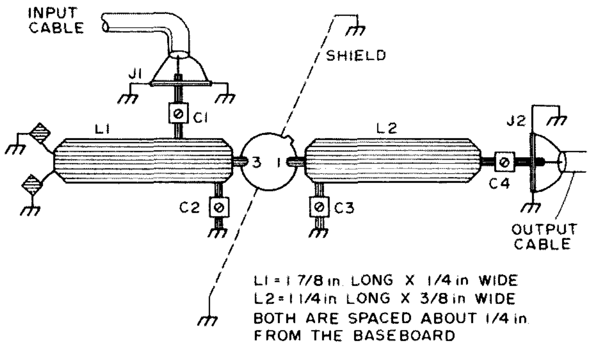


Fig. 4. Short connections to gate, drain, caps and jacks (450 MHz amp.) (pin view).

Referring to Fig. 4, for clarity, the input may be connected to almost any position along L1, to help with the matching. Bear in mind that some mismatch gives the lowest noise figure, with a sacrifice of only a dB or so out of over 20 dB of gain. C1 may also be varied for a maximum of over 100 pF, down to the small values, such as a 1 to 12 pF trimmer. I have shown the output connection as a series tuned circuit, and it works well that way into my tuned diode receiver for testing, but you may also use the same method as shown for the input. You should always make up a breadboard first, even though that has already been done for you here. 450 MHz needs some familiarization work, to say the least. At any rate, make a place on the baseboard and get ready to vary C1 along L1, and C4 along L2. If you move C4 up on L2, put in the grounding capacitors as shown for L1.

Bypassing

At 450 MHz you will have to use some construction methods not ordinarily needed for VHF work. We start off with making sure that the source is grounded for rf. Fig. 5, A, B, C and D, show the method I used, along with a whole collection of those tiny bypass capacitors, the "Lafayette Specials." The thin copper plate (see Figs. 3 and 5) is first soldered to the case of the FET. Hold the copper in a vise, as in Fig. 6, tin both sides lightly. Then tin the case also very lightly, applying heat for less than a second. Solder the case to the copper, as in Fig. 6, for no more than one second. A good idea is to practice on a 40841 that is either "gone" or a low gain one – or any other FET in the same size case. Do not use too

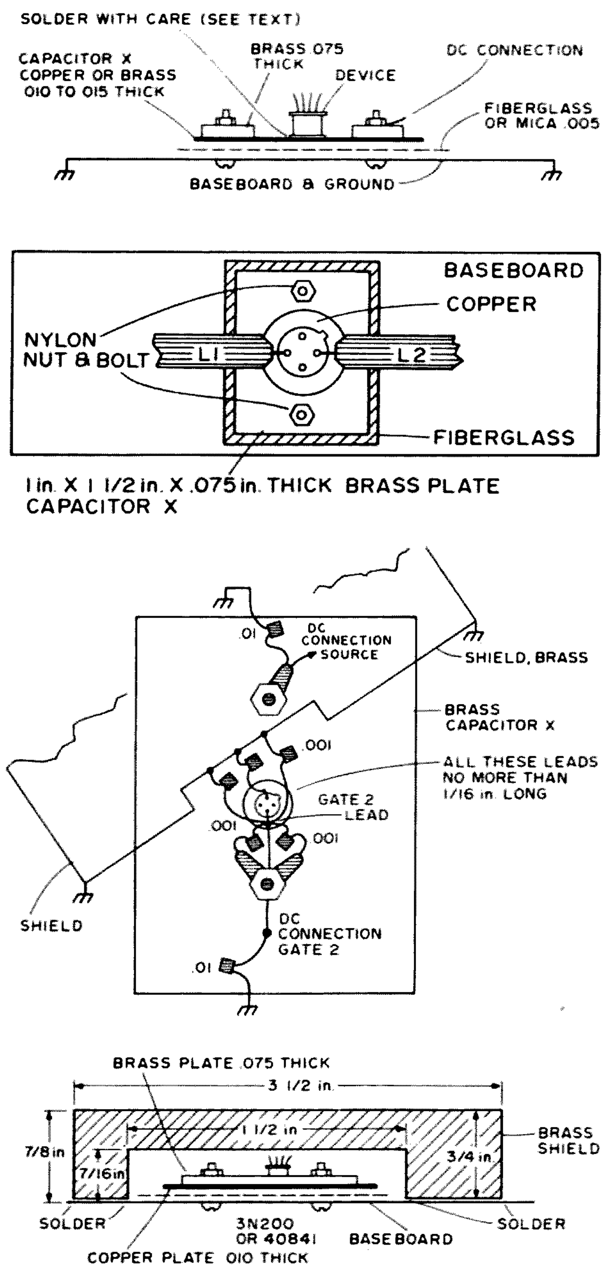


Fig. 5. A, B, and C (450 MHz amp).

low a wattage iron that will cause you to apply barely enough heat, since this means long application. I use a 50 watter for about one-half a second. Drill holes for the nylon bolts in the copper sheet and the brass "Cx" plate at the same time, holding them together in a drill vise or with C clamp. Be sure and insert fiberglass sheet, no more than .005 thick, or mica, under the copper when mounting. Check afterward with an ohmmeter for insulation. Use soldering lugs as in Fig. 5C, adjusting them so that there is about .13 cm spacing between the tips of the lugs and the gate 2 lead. Solder L1 and L2 as close as possible to the FET case. I managed about .06cm as in Fig. 5B. Solder a .001 from the shield to the source lead with no more than .16cm (1/16") leads, as in Fig. 5C. Solder two .001 capacitors from the gate 2 lead over to the capacitor "Cx" soldering lugs, as in Fig. 5C. Solder in C1, C2, C3 and

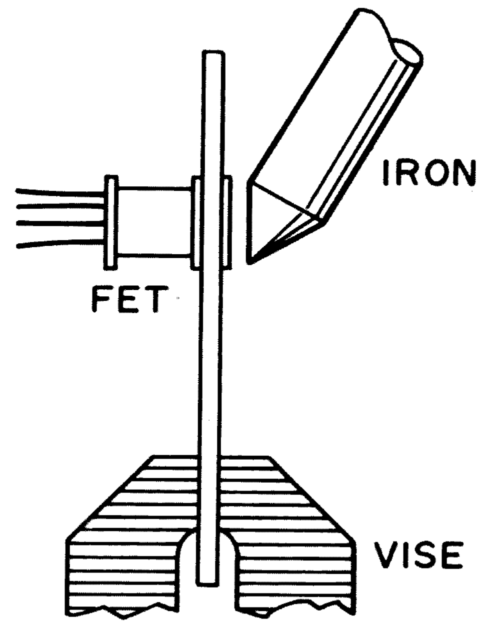


Fig. 6. Soldering FET case to copper sheet of capacitor X (450 MHz amp).

C4 as in Fig. 4. Small vertical pieces of copperclad are very handy for mounting J1 and J2 and for making good ground connections to them. Wire in resistors and other capacitors. Bypass the +12 lead wherever possible. I used red subminiature plastic covered No. 30 stranded for this. Dc voltage readings: When set up ready for testing, gate 1 showed 1V; gate 2 was at 5V, and the emitter was at .4 to .8V, depending on the resistor to ground. This should be adjusted for a total drain current of about 10 mils. Use more current for more gain and less current for a better noise figure.

Rf Testing

A separate section in *73* describes a good 420 to 450 signal source for this work. I used a tuned diode receiver, as shown in that section, for a receiver, with a good 0 to 50 microamp meter movement. A 10K pot in series with it allows voltage measurements of less than .05V, up to 10V. This is dc, at the diode output. First set up the signal source without the amplifier so that some con-

venient low reading may be logged, such as .02 to .05V, or near. Then when the amplifier is connected in the line some very much larger figure can be read, such as I found. For example, to be 20 times larger. Squaring the voltage to (at least approximate) get the power figure, and assuming that the diode is on a fairly straight-line portion of its curve, which may not be exactly the case, one could say that the power gain was 400 times, or well over the 20 dB mark. If you have a milliwattmeter, or a buddy who has one, or someone who works in a "radio" job, you can check it out that way. And also calibrate your signal source and attenuator.

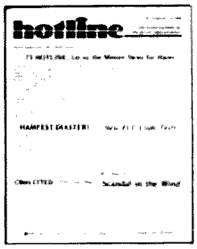
Alignment, or tuning L1 and L2 at 450 MHz is easier than matching the input and output cables, jacks and equipment at the other end of those cables. This you will find out as you get into the testing of these types of units. Remember that if you make it as shown, very excellent isolation of the input and output circuits will result. This shows up nicely as you tune up the output, for example, and find that the input tuning does not change. A very desirable result, of course. Note again, if you are the real experimenter type and wish to learn about 450, make a breadboard first, play around with it, and then make up a finished good looking unit using the same parts and placement. Small coils of three or four turns, about .13 cm O.D., can be substituted for L1 and L2, but you will then have to work in real close and use expensive, very small ceramic trimmers.

Conclusion

A good high gain, 20 dB plus, rf amplifier for 420 to 450 MHz has been built, is working, and has been described in detail here. You will have to pay a lot of attention to those tiny capacitors and to the short leads, though. Suppliers are as follows: FETs and mica compression trimmers from Cramer Electronics, Inc., 85 Wells Ave., Newton MA 02159, telephone 617-969-7700. Small capacitors from Lafayette Radio Electronics, 111 Jericho Turnpike, Syosset L.I. NY 11791, telephone 516-921-7500.

...K1CLL

HOT NEWS! for hams...



The 73 HOTLINE is published every other Friday. This newsletter will cover all the up-to-the-minute happenings in amateur radio... FCC news... new petitions filed... new actions... DXpeditions... new products... propagation flashes... Hotline Classified ads... job opportunities in the ham field... hamfest and convention news... contest news... all those things hams want right now, not two months later as is the case with a magazine. The 73 HOTLINE will be chock full of last minute news since it will be in the mail just a few hours after the deadline closes.

HOTLINE will be mailed to all subecribers (at $8 per year) by first class mail, marked Rush – Time Value. Our tests have shown that this class of mail seldom arrives later than airmail and often even sooner! HOTLINE will not be a simple typewritten sheet, as some newsletters are, but will be similar to the format of newspapers, with many times the information you might get elsewhere. Use the handy order form below and start getting the news you need to know while it's still news.

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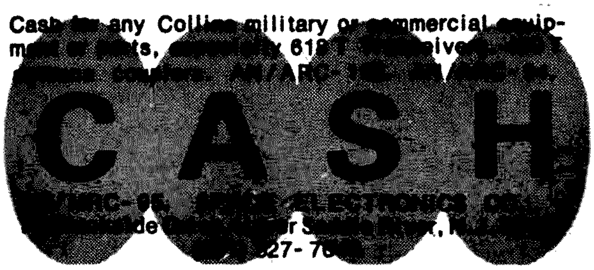


FINGERNAIL CLIPPERS

Kent A. Mitchell W3WTO
1004 Mulberry Avenue
Hagerstown, MD

Fingernail clippers, usually costing only about 25¢, make a handy tool for trimming back coaxial cable braid, such as during the preparation for the installation of a connector. Remove the outer protective covering, being careful not to cut or nick the braid beneath. Work the exposed braid inward from the end of the cable until the braid is bulged at the location of the desired trim length. Cut braid with fingernail clippers, as shown, and remove. Smooth out remaining strands.

...W3WTO

F. G. Rayer G3OGR
Longdon Heath
Upton on Severn
Worcester, England

GDO To Find C

An Accessory For Your Grid Dip Oscillator.

Most amateurs have a grid dip oscillator lying around, and an easy accessory can allow it to be used to read the values of unknown capacitances up to about 1000 pF. This is useful for unmarked surplus, those with obliterated markings, or to find the swing of small variables. Or we may check the best value found in some circuit position with a preset or variable, then measure this and substitute a near value fixed capacitor.

Figure 1 is the circuit. C1 and C2 are on the lid of an insulated box, carrying also spring terminals for CX. The capacitors have good knobs with pointers. Coil L can be half a dozen turns of stout wire, self-supporting, or anything which comes within a convenient range of the GDO (say 2.5–10 MHz) with both variables fully closed.

To calibrate, close C1 and C2 fully. Tune the GDO for the usual dip. Note the frequency on the box for future use. Take a few 1% capacitors, such as 100 pF, 200 pF, and so on, up to a total of about 1000 pF. Clip one to CX. Open C2 to restore the dip on the GDO. Mark the capacitor value on C2 dial. Series and parallel capacitors give more values. For example, 100 pF plus 200 pF in parallel gives 300 pF, while 500 plus 200 gives 700 pF, and so on.

Restore C2 to its fully closed mark. Repeat to calibrate C1, this time using

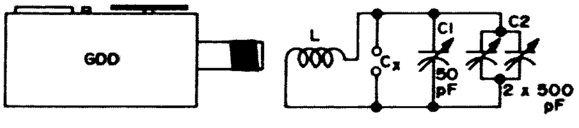


Fig. 1. GDO to find C.

capacitors such as 5 pF, etc., up to about 50 pF. When you see how the scales mark, estimate intermediate markings, to fill in.

Once calibration is finished, it is easy to find a capacitance value from about 2.5 to 1000 pF. Close C1 and C2. Put the GDO near L and tune the GDO for dip. Clip the unknown capacitor across CX. Open C1 or C2, as appropriate, to restore the dip. Read off the value from the scale. That's all there is to it!

. . .G3OGR

Dave Ingram K4TWJ
Rt. 11 Box 499
Eastwood Village 50N
Birmingham AL 35210

Super Trimline For 2

The popular Trimline telephones have recently started appearing on the surplus market at fairly reasonable prices and are being grabbed up quickly by the 2 meter FMers.

The phone can be converted in about an hour and they provide a mike, Touchtone pad and earphone in a convenient case ready to use.

Assuming you have acquired a Trimline through a local electric supply or surplus company, your first move is to check out the unit to ascertain that it is working. First, open the telephone by removing the 1/2" x 1" plastic strap between the top of the pad and the earpiece (easily popped out with a knife edge slid in the hole on the right side of this strap, and turned). Unscrew the two screws under this cover, then squeeze the front sides of the phone slightly to free the back cover.

Now connect the jumpers as in Fig. 1, and apply 6 to 8 volts to the pad. Pushing the numbers now should produce the tones on the earpiece. Audio can also be fed from the mic side of the .005 to an audio amplifier to

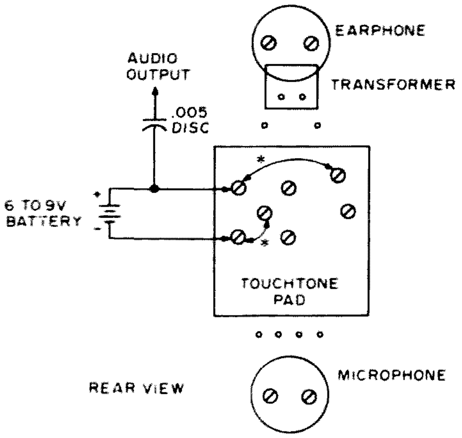


Fig. 1. Interconnections for checkout and operation of Trimline and pad; (*) jumpers added to unit.

check this – either way is OK. I might also point out that I've seen a dozen different ways to jump and connect these pads and they all seem to work fine. My particular method doesn't require a cut-off switch on the battery. If the pad works you can now start the conversion.

The flexible pc overlay must be removed. Unscrew it from the earphone, pad, and mike and unsolder the 4 or 6 connections (depending on your unit) above and below the pad. Discard the pc overlay as it will not be used. Next, remove and discard the transformer which is screwed into the earphone. A battery (either a Burgess H175 or H165R, both about 7 volts) will be installed here, with tape to hold it in place (these batteries fit snug and won't move when the back is replaced).

The pad now has to be removed to gain access to the mike. Unscrew the *4 large screws on the pad's brackets not the 4 small screws on the pad proper*, the latter will separate the pad's circuitry from the push buttons and it will drive you insane trying to get that disaster working properly again. Now *carefully* lift out the pad and you can gain access to the screws holding the mike bracket. With these loose, the carbon mike flops out and you can replace it with a mike to match your rig. For convenience connect the mike wires to the holders spring clips making sure the connection is on the left (viewed from rear). Then reassemble the holder and retaining bracket and replace the pad. The screw terminals on the mike holder are now ready for connection (you did mark the + end didn't you?). Now, using small insulated hook-up wire (to prevent accidental contact with other leads) connect the jumpers as in Fig. 2 (again, remember you removed them to discard the pc overlay). You can use the pc lead on the left side of the pad, which runs to its bottom, and solder the .005 from this connection to the resistor, R1. The other side of this resistor connects to the mike +, so the pad and mike are in parallel.

Now remove the earphone and carefully drill a small hole right beside and slightly below it to accommodate the P.T.T. switch (switchcraft #953 or similar) mount the

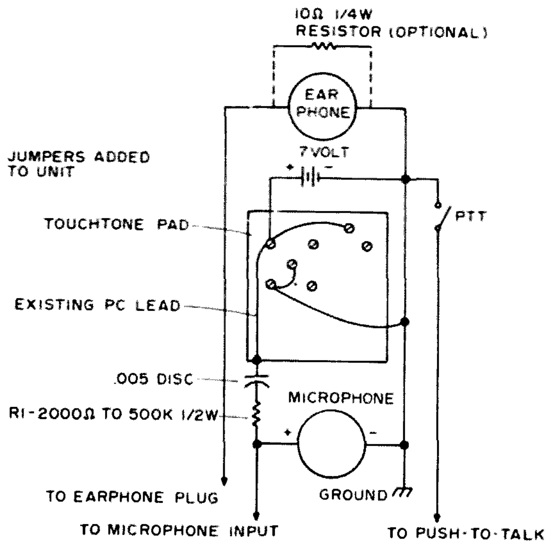


Fig. 2. Wiring diagram for "Super Trimline." The optional 10Ω resistor across the earphone gives an 8Ω load to the rig. (Existing earphone is 600Ω).

switch and replace the earphone. Wire in the battery.

Next, using more insulated hook-up wire, connect all the grounds together: the mike; the pad ground; the P.T.T. ground and the earphone ground.

All that remains is the curl cord and plugs (mike and earphone) to match your rig. A Belden #8497 cord was used, which has 3 conductors, and one shielded. Remove the rubber jacket so about 8 inches of each wire is available. Strip each wire end 1/4" and connect the P.T.T. lead, earphone +, mike +, and ground leads. I found a small piece of metal and force fit this between the curl cord end and the grooves on the mike holder's slots to retain the cord under heavy stress. Resistor R1 is found experimentally by temporarily substituting a 1 or 2 meg variable and adjusting this so the pad's output level is the same as your voice. When this level is found, measure the value of the pot and replace it with a fixed resistor of the same value. This isn't critical – my particular unit used a 6800Ω resistor.

Replace the back of the Trimline, the screws and little plastic cover above the pad and you have a dandy "Super Trimline."

. . . K4TWJ

M. J. Schaffer W6ONL
4424 Baron Avenue
Sacramento CA 95821

R-390A Modifications for Improved Performance

Not for sale: One R-390A receiver, original cost $3,900. Depending upon condition surplus costs vary from $550 to as much as $1,500 each. The receiver features four mechanical filters, 2 kHz, 4 kHz, 8 kHz and 16 kHz, with additional bandwidth switching to 1 kHz and .1 kHz. The receiver has two individually controlled audio channels. One for conventional local reception, and a second 600Ω output for phone patch connection. The phone patch output has a vu meter that can be adjusted by a front panel line gain control, and a line meter level switch to read audio levels at -10 vu, 0-vu and +10 vu. A front panel carrier level meter is calibrated not in S-units but from zero to 100 dB. It features a 850 cycle audio filter, frequency digital readout accurate to 200 Hz or better, 100 kHz calibrator, a BFO that swings 3 kHz each side of center frequency with extreme accuracy. The receiver covers .5 MHz to 32 MHz in 1000 kHz segments. Muting, AGC output, space diversity connections, etc., are available at rear-end terminals. An on-off switch is provided to turn on temperature controlled ovens within the various oscillators. Except for the 455 kHz i-f stages, all other stages from the rf to the second and third conversion stages are permability tuned. This and many other features make this one of the best radio receivers available today. After having obtained one a number of years ago I decided that it had some unsatisfactory shortcomings that I needed for sniffing a gas-bubble out from under a hurricane of big pile-ups. In my opinion, it lacked sensitivity, had insufficient and poor audio quality and the limiter contributed nothing to DXing, SSB, or anything else for my modes of operation.

After studying the manual and its various diagrams for several weeks I decided that many improvements could be achieved by adding or subtracting components, and revising certain circuits. All modifications that would be made were with the intent for quick and easy restoration in the event that a sale or swap might be forthcoming at some later date.

After having made the modifications I've reached the conclusion that nothing I have tried in the way of other receivers even closely approaches a comparison of performance.

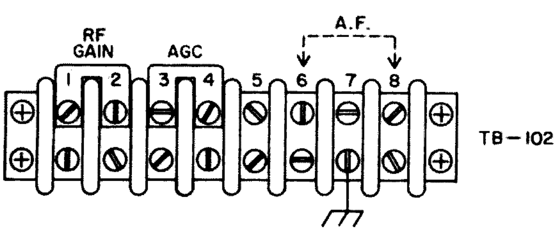
Modifications

For my applications the R-390A has unsufficient earphone volume. Inspection of the manual diagram shows that the earphone audio has been padded down purposely by a resistive network. Fig. 1, shows the simple modification for increasing earphone volume from 2 mW to 500 mW. As seen in Fig. 1, this modification is a jumper placed across

terminals 6 and 8 on TB-102, located behind the rear main chassis.

For DXing and normal ham use the 8 kHz and 16 kHz bandwidths are useless unless one desires to listen to hi-fi broadcast, or other applications that require these excessive bandwidths. To meet these bandwidths the 455 kHz transformers have hi-Q coils which haves been swamped with 15K resistors to broaden their bandwidths. This lowers their gain capabilities and contributes to additional noise. The second modification is for the removal of the 15K resistors and bridge the 455 kHz primary and secondary windings in each of the i-f transformers.

Locate the 455 kHz i-f cans labeled T-501, T-502 and T-503. To get at the 15K resistors loosen the nuts atop each i-f can and lift off the shield can. At this point it is a good idea to drill small holes in the center of each i-f can so that i-f alignment can be



DOTTED LINE SHOWS JUMPER TO INCREASE EARPHONE VOLUME FROM 1 mW TO 500 mW.

Fig. 1. Dotted line shows jumper to increase earphone volume from 1mW to 500mW.

performed later on. With the shield cans removed, the windings are visible and easy to get at. With the exception of T-503 secondary winding all other windings are bridged with a 15K resistor.

To prevent a shock and shorting of B+ voltages in the primary windings which could lead to a winding burn-out, be sure the receiver function switch is in the OFF position before attempting resistor removals. With small dikes, clip one end of each resistor from the most convenient terminal, and bend the resistor back out of the way. Before going too far it is suggested that only resistors in T-503 and T-502 be removed first, and that the set then be turned ON to the AGC position and checked for i-f ringing This can be accomplished by listening, or by the use of an oscilloscope connected across

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the audio output terminals. In my set, with the rf gain control completely open, ringing did not occur until R-115 across the primary of T-501 had been disconnected. Enough pigtail wire had been left on this particular resistor so that reinstallation was an easy matter.

The increased gain and audio recovery as individual resistors are removed can be measured by use of the vu meter. Using the 100 kHz calibrator as a fixed signal source, turn the BFO pitch control for a maximum vu meter reading. The vu line meter control should be set at 0 dB, and the line gain control adjusted to show a vu meter reading of -5 vu. Approximately 2 vu units of gain was obtained as each resistor was removed. The overall audio recover increased approximately 7 vu units at the stopping point of resistor removal. The carrier level meter will also show an increase as T-501 and T-502 are modified.

A better means of measuring an increase or decrease of gain other than using the carrier level meter (AGC) which curtails accuracy because of AGC action is to remove the AGC jumper bridging terminals 3 and 4 on terminal strip TB-102. With a short jumper, ground terminal 4 to the main chassis. This grounds the whole AGC bus line to zero potential, just as the FUNCTION switch does in the MHz position. Connect a VTVM to terminal 3 to read the generated AGC voltage produced by the AGC system. The FUNCTION switch must be in the AGC position in order to get AGC voltage readings. After assurance that no ringing is present, and that the i-f shield cans have dead center holes for alignment, replace the shield cans and their associated hold down nuts. Now, realign the 455 kHz i-f system for peak AGC voltage as read on the VTVM. Maximum AGC voltage will be approximately 35V when using the 100 kHz calibrator as a signal source, when the BANDWIDTH switch is in the .1 kHz position. This AGC voltage will reduce to normalcy when the AGC system is loaded down by the removal of ground from terminal 4 and restoration of the jumper between terminals 3 and 4. During alignment do not overlook peaking of Z-503 located between the AGC i-f amplifier and the AGC rectifier.

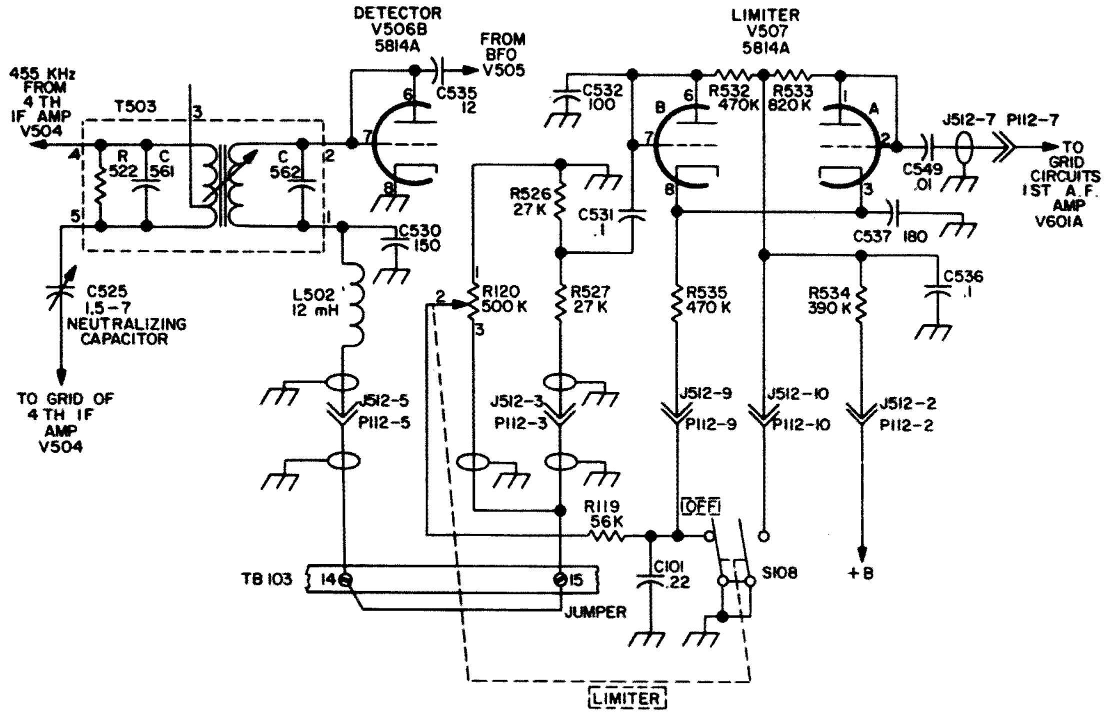

Fig. 2a. Detector V50613 and Limiter V507, original schematic diagram before modification

Product Detector

See Fig. 2a (before modification) and 2b (after modification) for the following in structions.

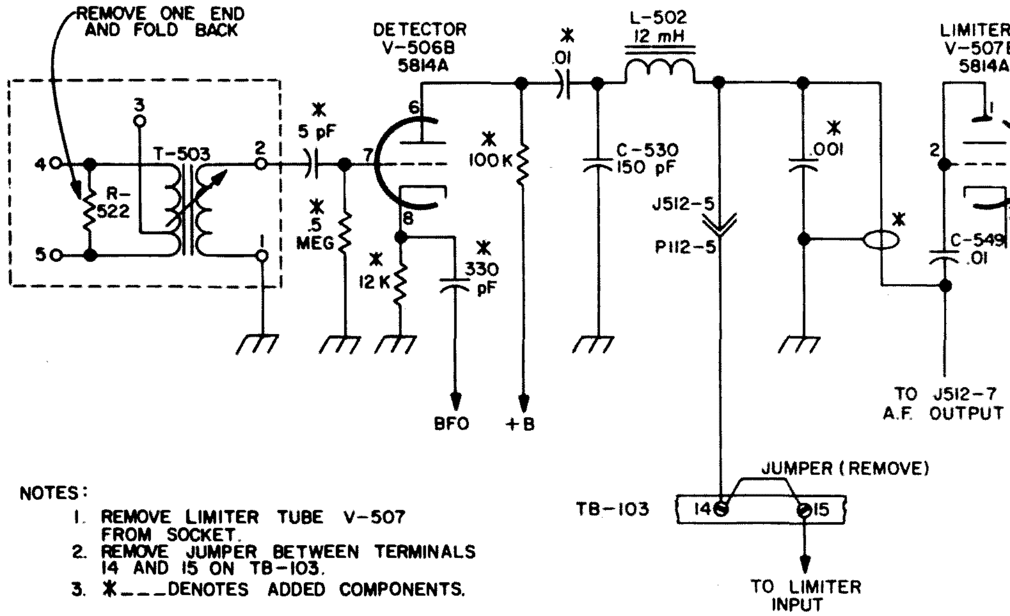

Fig. 2b. Diode detector modifications for product detection.

The last detector (V-506B) has pins 6 and 7 of the 5814 tube connected together to form; a diode detector. Both the i-f signals and the BFO are injected at this point. This serves quite well for the reception of all emission modes and matches the voltage levels needed at the limiter input circuit. However, since little A3 or MCW is ever copied, and the limiter is seldom used and had a certain amount of attenuation, I felt that a product detector would best serve my needs. The diode detector was converted to a product detector by lifting the cathode at pin 8 from ground and using the cathode for BFO injection. The BFO coupling capacitor (C-535, 12pF) was replaced with a 330pF capacitor tied to pin 8. The BFO voltage measured 9V at pin 8. Readjustment of the BFO to zero beat the 455 kHz may be required because of this additional loading.

To break the diode feature remove the jumper between pins 6 and 7 of the detector. To pin 6 add a 100K resistor and a .01µF capacitor. Connect the 100K resistor to a source of B+ which can be found nearby on a standoff binding post. From the secondary of T-503, terminal 1, remove C-530 (150pF) and L-502 (12mH). To L-502 connect the 0.01µF capacitor that was attached to pin 6. Leave C-530 (150pF) attached at this point. The other end of rfc L-502 runs through connecting leads to terminal 14 (diode load) on TB-103, jumpered to terminal 15, and back to the limiter on the same chassis. To this end of the rfc install a .001µF, 600V dc capacitor to ground. The center post of the tube socket is grounded and makes a convenient grounding point. Also, to this end of the rfc run a shielded wire to C-549, which is con-

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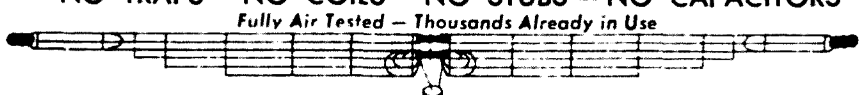

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nected to pins 1 and 2 of the limiter tube. Connection to C-549 should be on the side opposite to the C-549 connection to the limiter tube. Remove the jumper between terminals 14 and 15 (diode load) on TB-103 behind the receiver.

Now for the product detector grid circuit. With a short jumper ground terminal 1 of T-503. Remove the lead from terminal 2 of T-503 that goes to pin 6 of the original (V506B) a small .47MΩ resistor to ground, and a 5pF capacitor to terminal 2 of T-503. That completes the product detector modification, except for repeaking of transformer T-503 and removing the limiter tube from its socket.

As before, with the 100 kHz calibrator as a signal source, the measured i-f voltage at the grid of the product detector was 3V. This is only a 3 to 1 ratio, which is a far cry from the 10 to 1 or better ratios normally expected for best linearity. Many different ratios were experimented with and the end result is a detector that produces both AM and SSB with only moderate distortion on AM. The amount of audio recovery also proved best with this ratio. The added conversion gain also added a few more dBs to the output.

Power Supply

The original power supply incorporated a pair of 26Z5W rectifiers tubes. Some conservation of power and a great reduction of heat was gained by replacing the tubes with solid state rectifiers. 1000 PIV units at 2.5A only cost 35¢ each, which is a wise investment. The voltage increase through the conversion to solid state was slight, and no effort was made to change it.

Antenna Input Alignment

The nominal antenna input impedance is 125Ω. This can be maintained and matched to a 50Ω antenna system using any of the various forms of antenna tuners. Lacking a tuner, better performance can be accomplished by realigning the antenna input circuits to match your antenna system. I happened to have a small battery operated 100 kHz oscillator that I've used for antenna work that is set on the far side of my antenna. Its output is sufficient for signal pickup on all the ham bands up to 30 MHz. This steady fixed signal source is invaluable for antenna adjustments, and for matching my receivers to the antennas for best sensitivity. by this means of starting at the antenna and working through to the receiver a matched system is achieved.

Using this system with the R-390A receiver is simple. With the antenna trimmer set at zero, adjust the slugs and trimmer capacitors in the rf antenna input stages for all of the ham bands for maximum AGC voltage, as outlined previously, or for maximum carrier level meter readings. The antenna trimmer does tune out the reactances encountered at this QTH using trap vertical antennas. The improved signal to noise ratios are well worth the work involved.

Performance

First, let me stress the importance of any receiver that has a fixed frequency calibrator and an "S" meter indicator, as a means for judging receiver performance over prolonged periods. As time progresses a receiver's performance can be expected to fall off as tubes and components age. When I first received my R-390A I recorded the carrier level readings of the 100 kHz calibrator every 100 kHz from 500 kHz through 30 MHz. When atmospheric conditions prevail to a point that you begin to doubt whether or not your receiver has lost its sensitivity, it's then only a matter of referring to the original list of level readings to make this determination. With the R-390A these readings will average approximately 50 dB throughout its spectrum range. Lacking suitable test equipment, such as a calibrated signal generator and a distortion analyzer, performance could only be judged against before and after modifications, and against a comparative performance of other receivers that have been in the shack from time to time. Splitting and swapping antennas between the two receivers, and peaking each set to the same signal has shown that the R-390A has better sensitivity, better selectivity and is more versatile than anything compared with so far.

. . . **W6ONL**

Jack Spillane W7UGV
2010 N.W. 60th
Seattle WA 98107

THE R-392 ON THE AIR

I recently purchased an R-392 and have been using it as a second receiver for several months.

The R-392 is a triple conversion receiver with a tuning range from 500 kHz to 32 MHz. This range is covered in one megahertz steps except for the first band which covers 500 kHz to 1 MHz. The calibration accuracy is 300 Hz.

Power Supply

The R-392 requires 28V dc approximately for both the filaments and plate supply. The total current required is 3 amps.

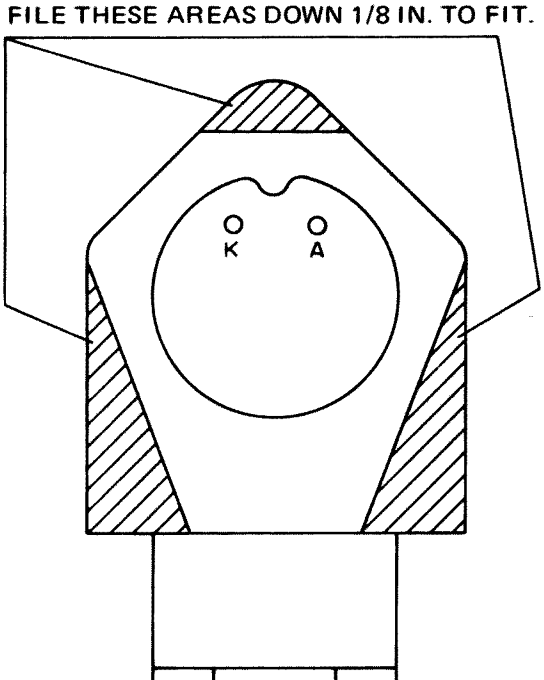

Fig. 1. Modification to power plug marked FRANK UW1320FA13.

The power supply uses a 27V transformer with a rating of at least 3 amps.

The regulator is a Darlington pair consisting of Ql and Q2. The base of Ql is controlled by a 27V zener diode. This sets the output voltage at the emitter of Q2 at somewhat less than 27V. Q2 is heat sunk to the chassis using a mica washer. Q2 is mounted with a mica washer on its own heat sink (a Motorola HEP 500 unit). This heat sink should be mounted in a vertical position with the fins at right angles to the top of the chassis. Mount Ql and Q2 using silicone grease.

Power Plug

The power plug I purchased would not fit the receiver. I modified the plug by filing away part of the lower part of the case as seen in Fig. 1. The plug is labeled FRANK UW13020Fal3.

Audio

The audio output impedance is 600Ω. I use a speaker system with a 500Ω to 4Ω transformer installed in the speaker cabinet. Fair Radio Sales Co., P.O. Box 1105, 1016 E. Eureka St., Lima, Ohio 45802, sells the LS-166/U speaker recommended by the R-392/URR manual.

Controls

Most of the controls are standard on any communications receiver. The controls covered here are peculiar in the R-392.

FUNCTION SWITCH

Off – Power off.
Normal – Power on.
Limiter – Noise limiter on.
Net – Defeats transmit/receive relay.
SQ – Squelch. Received carrier trips relay to turn on receiver audio. The squelch level is controlled by the rf gain squelch thresh.

AGC SWITCH

Off – Removes AGC voltage from receiver grids.
On – Places automatic gain voltage on the receiver grids.
Cal – In the CAL position the 100 kHz calibration signal is turned on and the receiver input is removed from the antenna input connectors by a relay.

DIAL LOCK

Locks the kHz dial.

DIAL ZERO

When pushed in and turned this allows the kiloHertz dial to be moved a small amount when the dial lock is on.

I-F OUT

455 kHz out for i-f type FSK RTTY converter (possibly the CV 278 frequency converter) this output could feed an external i-f amplifier with a 455 kHz filter and a product detector.

TUNING

Example:
Let us say we want to receive on the 40m band on 7.250 MHz.
1. Set the MegaHertz dial to 7.
2. Set the kiloHertz dial to 250.

CALIBRATION

Example:
Calibrate to the nearest 100 kHz the frequency of 7.200 MHz.

1. Turn AGC switch to CAL.
2. Turn on BFO and set BFO to 0.
3. Set MegaHertz dial to 7.
4. Set kiloHertz dial to 200.
5. Zero beat the 100 kHz signal with the kiloHertz dial.
6. Lock the kiloHertz dial.
7. Push in and adjust the dial zero to the nearest 100 kiloHertz.
8. Unlock dial zero.
9. Turn AGC switch to AGC.

I would recommend the purchase of an instruction book for the R-392/URR receiver. This manual will give you complete information on repair, alignment and operation.

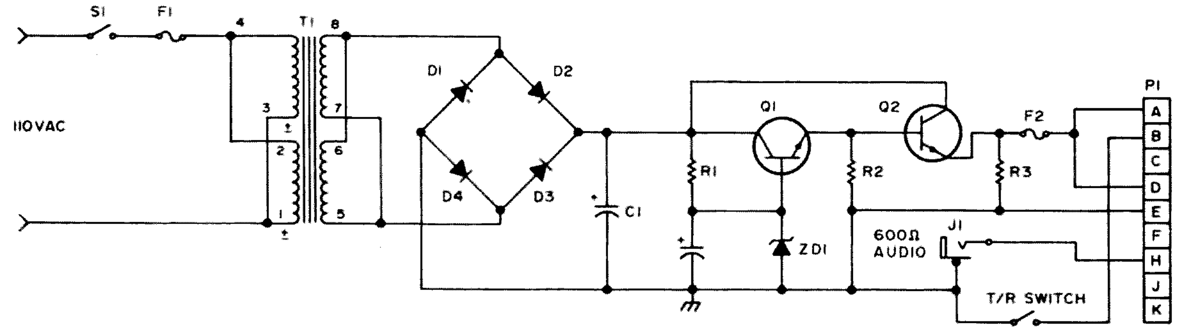

Fig. 2. R-392/URR power supply.

Parts List

Si – toggle switch.
F1 – 1.5A slow blow fuse.
F2 – 5A fast blow fuse.
T1 – Fair Radio Sales Co., Part No. 5950-645-3854. 26.4V @ 3.04A.
D1-D4 – 6A 100 Piv. HEP R0101
C1 – 4000 µF 50V.
C2 – 100 µF 50V.
R1 – 470Ω 2W.
R3 – 1000Ω 2W.
ZD1 – 27V zener diode HEP 608.
Q1, Q2 – RCA SK 3027 or HEP 704.
J1 – Phone jack.
P1 – R392/URR power plug. Fair Radio Sales Co.
Quantity
2 – HEP 450 transistor mounting kit (mica washer, socket and screws).
1 – HEP 500 heat sink.
1 – Tube of silicone grease.

. . . W7UGV

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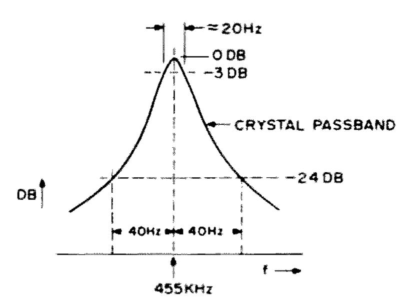
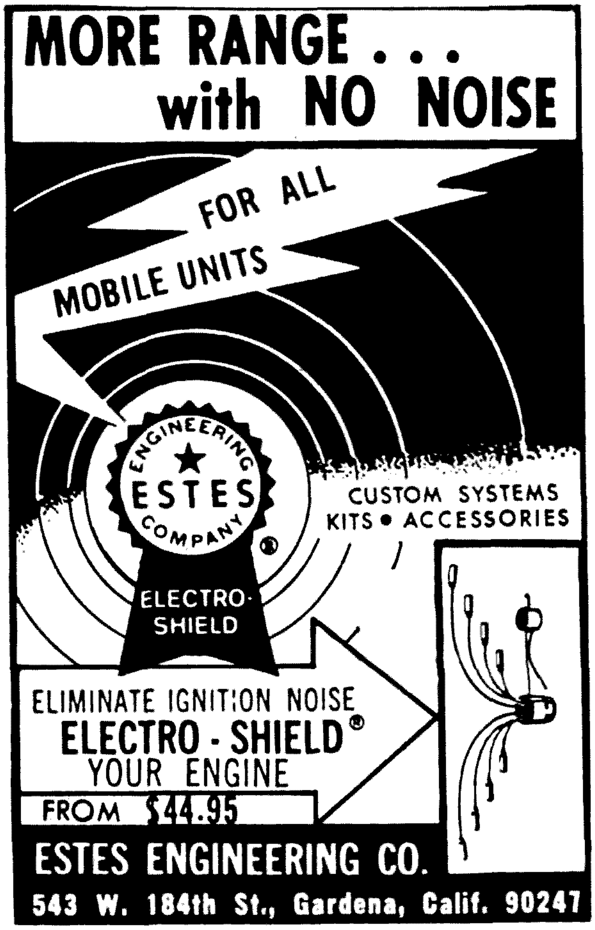


Fig. 1a. The effect of slight mistuning or receiver drift on the strength of a CW station.



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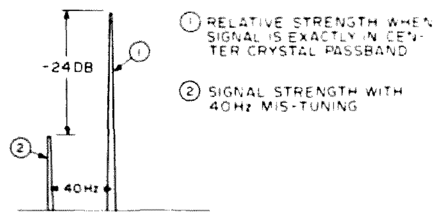


Fig. 1b. Results of mistuning or receiver drift causing 24 dB signal strength reduction.

Fig. 1a, shows a representation of a typical single crystal filter bandpass characteristic. Note that on either side of the peak, the response falls rather rapidly (12 dB per octave). At plus or minus 40 Hz, the response is down 24 dB. Consequently, a slight mistuning or receiver drift causes a 24 dB signal strength reduction as shown in Fig. 1b. The operator must then adjust the receiver tuning in order to move the 40 Hz up into the maximum response of the crystal.

One can now ask the question: How can the signal be automatically positioned at the maximum response point of the filter regardless of receiver drift?

One rather infrequently used technique for obtaining high selectivity which has been known for some time, is the capacitor

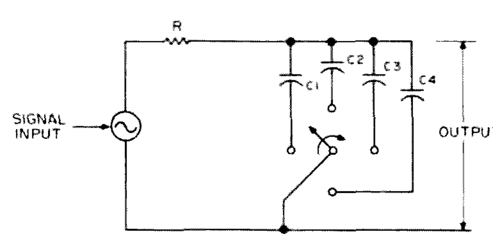


Fig. 2. Network.

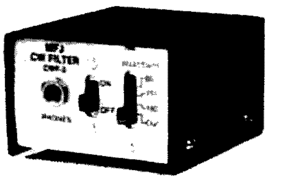
sampling technique . Fig. 2, shows a network consisting of a resistor, 4 capacitors, and rotary switch. (Any number of capacitors greater than 2 can be used.)

The rotary switch is only a convenient representation of electronic switching.

Assume that the switch is rotating at a frequency of say 1000 Hz. Let us look at the output of the network when the input frequency matches the frequency of switch rotation.

If the R and C's are large enough, a capacitor will charge up to the average value

CW FILTER



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SPECIFICATIONS

BANDWIDTH: 80 Hz, 110 Hz, 180 Hz (Switch selectable)
SKIRT REJECTION: At least 60 db down 1 octave from center frequency for 80 Hz bandwidth
CENTER FREQUENCY: 750 Hz
INSERTION LOSS: None. Typical gain 1.2 at 180 Hz BW, 1.5 at 110 Hz BW, 2.4 at 80 Hz BW
INDIVIDUAL STAGE Q: 4 (minimizes ringing)
IMPEDANCE LEVELS: No impedance matching required
POWER REQUIRED: CWF-2: 6 volts (2 ma.) to 30 volts (8 ma.); CWF-2BX: standard 9 volt transistor radio battery
DIMENSIONS: CWF-2: 2"x3" PC board, CWF-2BX: 4"x3 1/4"x2 3/16" (black winkle steel top, white aluminum bottom, rubber feet)

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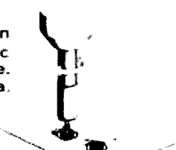

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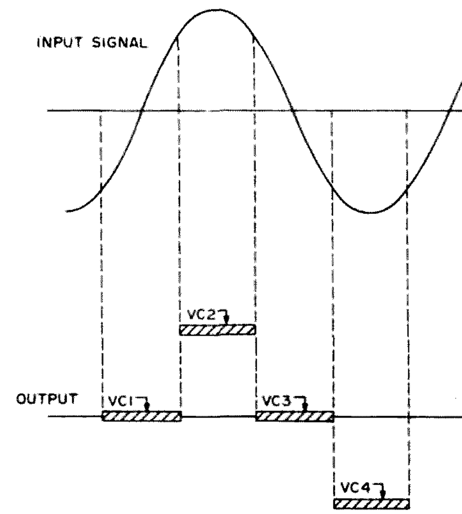

Fig. 3. Complete cycle of switching.

of signal voltage it sees when it is connected. This C1 charges to zero volts because it always sees an equal amount of positive and negative voltage when it is connected. C2 charges to nearly the peak value of the sine wave. The resultant of complete cycle of switching is shown in Fig. 3. When the switch rotation frequency or the input signal frequency is changed, the response falls off at a rate of 6dB per octave. The bandwidth of this type of filter is determined by the RC time constant. The greater the R and/or C, the narrower the bandwidth. Extremely narrow bandwidth can be obtained as low as 1 Hz at 1 kHz. The center frequency of the pass band is equal to the frequency of rotation of the switch.

It now becomes clear as to how the tracking capability is obtained. One merely has to use a voltage controlled oscillator (VCO) to drive the capacitor switch and phase lock the VCO to the input signal as shown by the block diagram of Fig. 4.

The dual flip flop and the 7402 decoder turn transistors Q1 through Q4 on in sequence and thereby connect the capacitors in the circuit in sequence. The action as explained earlier forms a narrow band network between the receiver af output and the headsets. A small amount of signal is picked off at the filter output by resistor network R1 and R2 and is compared to the flip flop divider output by the phase detector FET. The resultant difference dc

voltage is amplified and slaves the VCO frequency to be exactly 4 times the input signal frequency. Capacitor C1 is used to hold the VCO on frequency between dots and dashes. Thus, any slight drifting of the input signal frequency will pull the VCO (and the pass band) along with it.

Refinements can be added. Resistor R can be varied to adjust the filter bandwidth for optimum readability. The filter peak can be swept up and down by feeding a positive or negative current into point A. This feature is handy for

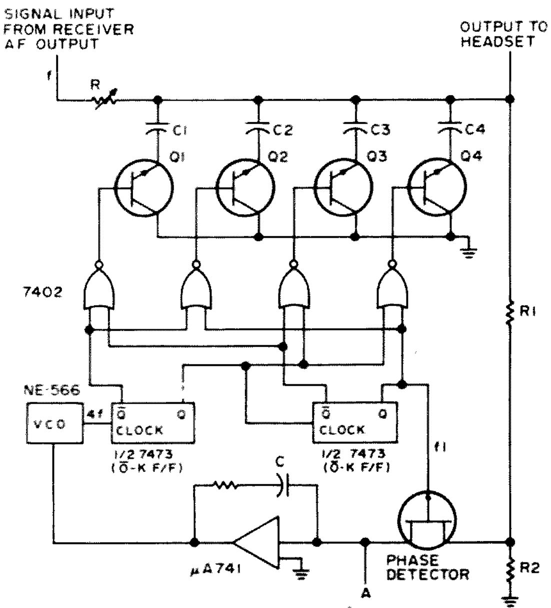

Fig. 4. Phase locked VCO to the input signal.

roundtable QSO's where the other stations may be on slightly different frequencies.

The filter network has a tendency to respond to harmonics of the desired frequency. To minimize this effect, low pass filters can be used ahead of and after the switched capacitors network. The output low pass filter can also be used to smooth the output shown in Fig. 3, into a sine wave.

An experimental unit was constructed and the results were excellent. This is the first CW filter I've seen where the pass band can be made as narrow as desired *without* oscillation. It can be made narrow to a point where the dots and dashes actually run together even at slow speeds. Perfect tuning is always maintained by the phase locked loop.

. . . W2FSO

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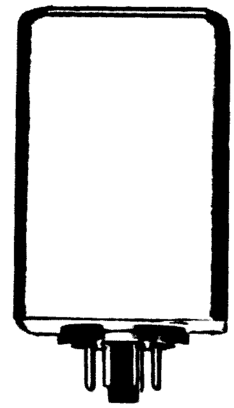

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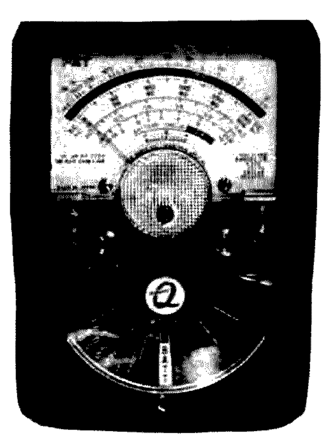

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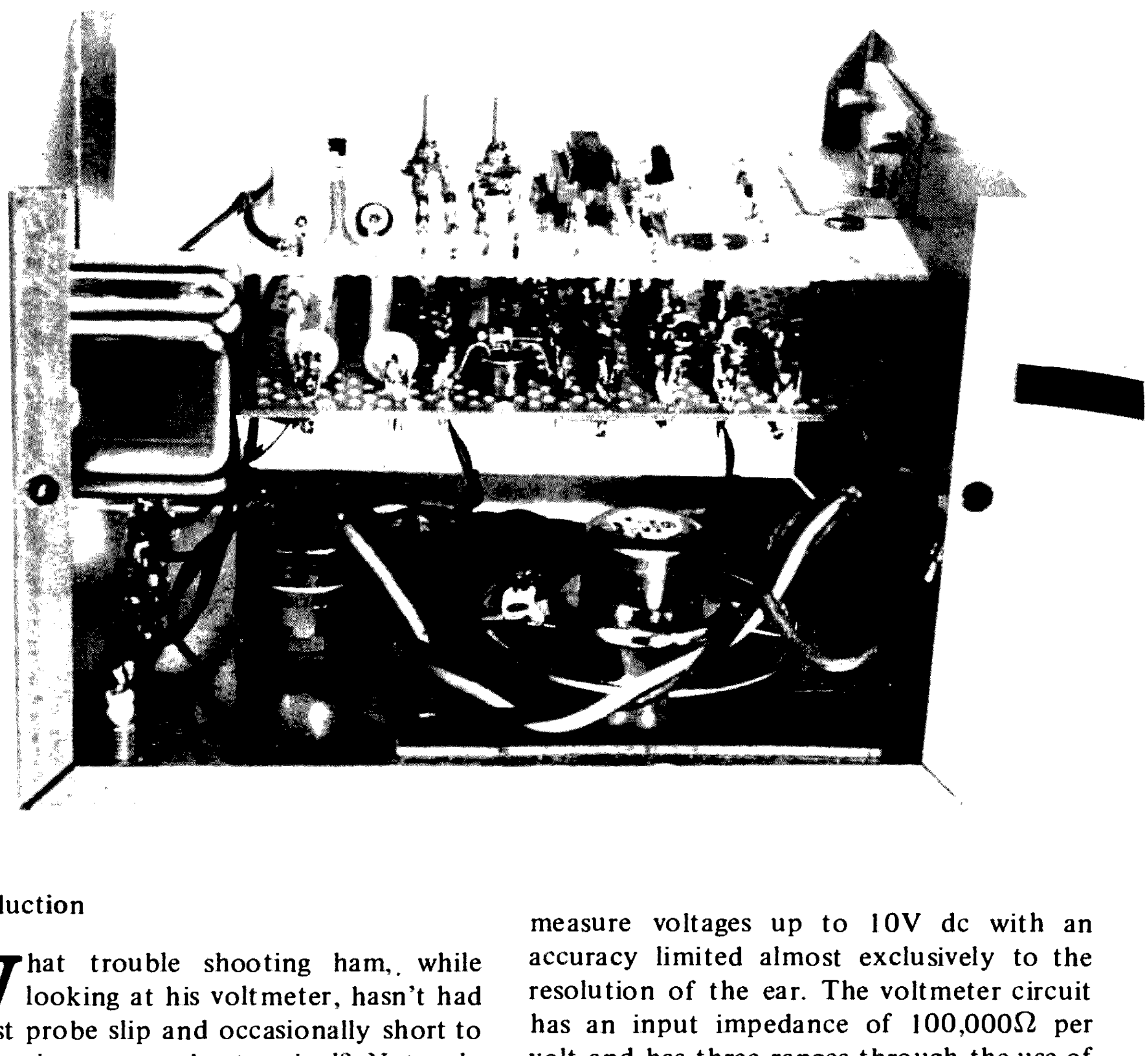

Introduction

What trouble shooting ham,. while looking at his voltmeter, hasn't had the test probe slip and occasionally short to the chassis or a nearby terminal? Not only are wayfaring test probes a nuisance but to unforgiving semiconductor devices they can be a terminal affliction. Through the use of a voltage-controlled audio oscillator voltages can be approximately measured by listening to the oscillator frequency. This allows one to keep his eyes on the circuit being tested and the test probe, minimizing the tendency for the probe to wander.

Operation

The audible voltmeter of Fig. 1, can measure voltages up to 10V dc with an accuracy limited almost exclusively to the resolution of the ear. The voltmeter circuit has an input impedance of 100,000Ω per volt and has three ranges through the use of three separate input jacks: 0 to 0.1V, 0 to 1V and 0 to 10V. In each case, a "full-scale" voltage applied to the appropriate input jack will produce a 1000 Hz tone from the voltmeter speaker. Voltages less than the "full-scale" voltage will produce a correspondingly lower frequency which is directly proportional to the voltage applied.

A test jack is provided to conveniently supply +1V for using the voltmeter as a continuity checker. The test jack also can be used to calibrate the ear to 1000 Hz by

connecting it to the 1V jack and to calibrate the ear to 100 Hz by connecting it to the 10V jack.

Circuit

The schematic diagram of Fig. 1 can be divided into four sections: the dc amplifier, the oscillator, the audio amplifier and the power supply.

The dc voltage being measured is scaled by op amp A1 and its associated circuitry. The voltages indicated on the input jacks produce a dc amplifier output voltage of -2.25V. To prevent the op amp offset voltage from causing a continuous audio tone or nonlinearity at low voltages, offset null pot R6 is adjusted for 0V on IC terminal 12 with no input voltage applied.

A simple, linear, voltage-controlled audio oscillator circuit is composed of op amp A2 and the adjoining components. The circuit is basically an op amp integrator with a programmable unijunction transistor to discharge the capacitor. To calibrate the audible voltmeter, variable resistor R7 is adjusted for an oscillator frequency of 1000 Hz with +1.0V applied to the +1.0 voltmeter input jack. The audio oscillator output is a sawtooth wave and has an output frequency versus dc input voltage relationship which is extremely linear. Because the voltage controlled oscillator has possible applications where different input voltage versus output frequency relationships or different output amplitudes are required, a detailed description of the oscillator circuit and its characteristics follows.

Oscillator

The voltage controlled oscillator or voltage-to-frequency converter used in the audible voltmeter provides a linear output with a minimum of parts. Because the circuit may be easily adapted to a variety of ham projects from an audible SWR bridge for mobile operation to instruments for the visually handicapped, a detailed description of circuit operation is given.

Circuit Description

The voltage controlled oscillator shown in Fig. 3,is basically an op amp integrator and a discharge circuit. Some component values have been changed from the oscillator in Fig. 1, to simplify plotting the graph of Fig. 3. A negative voltage at E_{in} causes the op amp output to go positive, charging C1 with a current equal to the current caused by E_{in}. When the output voltage on capacitor C1 reaches the threshold voltage of Q1, the programmable unijunction transistor (Q1) turns on and remains on until C1 is discharged. (Resistor, R_c, limits the peak current through Q1.) The op amp output then returns to 0V and the cycle repeats, thus generating a sawtooth output waveform.

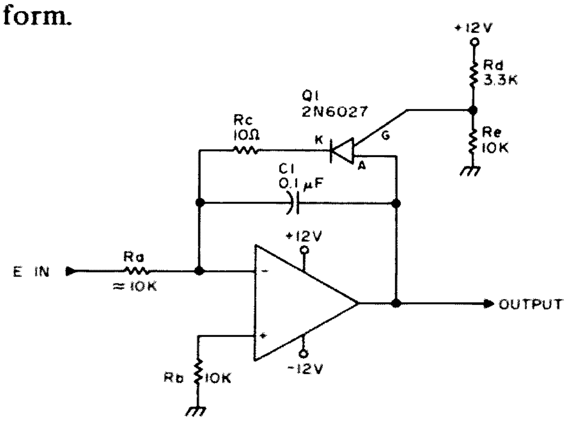

Fig. 2. Voltage controlled oscillator circuit.

Output Amplitude

The peak amplitude of the output waveshape is determined by the programmable unijunction transistor threshold voltage and is equal to the gate voltage plus 0.6V. Since the gate voltage is entirely determined by R_d, R_e, and the +12V supply of Fig. 2, the output sawtooth amplitude may be varied over a wide range by changing the resistor values or the supply voltage.

Output Frequency

The voltage-to-frequency converter output frequency is a function of the input current and the value of C1, once the peak output voltage has been chosen. Since the op amp inputs are at ground potential and draw negligible current,

$$I_{in} = \frac{E_{in}}{R_a}$$

Therefore, the current charging C1 will equal E_{in}/R_a. Given that the voltage on a capacitor is equal to the charge in coulombs divided by the capacitance in farads,

$$V = \frac{Q}{C}$$

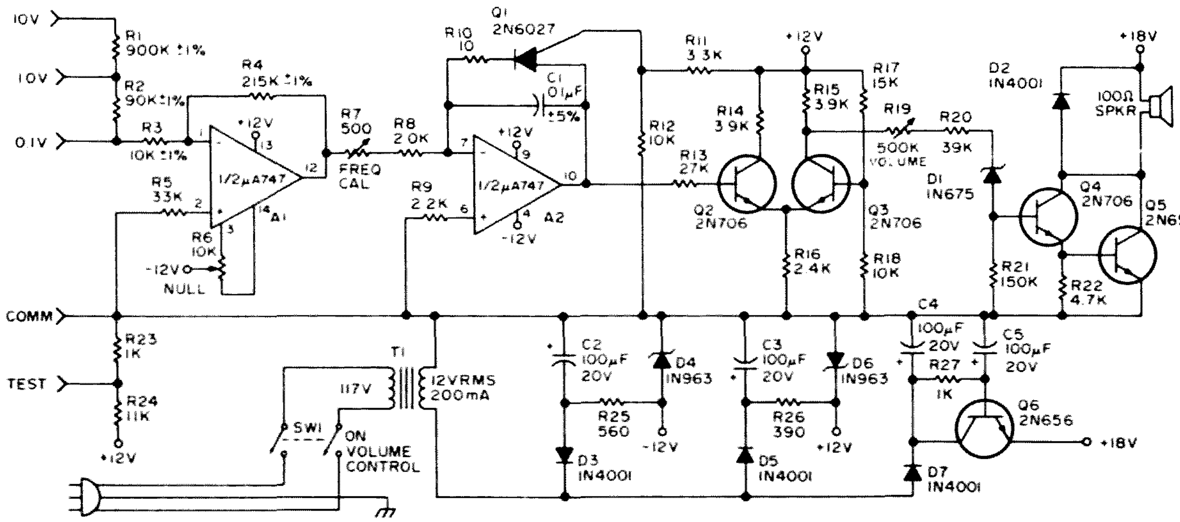

Fig. 1. Construction of voltmeter.

and that current is coulombs per second,

$$I = \frac{Q}{S}$$

the voltage on C1 will increase at a rate expressed by,

$$\triangle V c1 = \frac{Ein}{Ra\ C1}\ \frac{volts}{second}$$

When C1 has charged to the Q1 threshold, the programmable unijunction transistor discharges the capacitor and the cycle repeats. The time for one pulse can be found from the threshold voltage and the charging rate.

$$T = \frac{V\ threshold}{\triangle Vc1\ \frac{volts}{second}}$$

The time for one cycle is the capacitor charging time found above plus the C1

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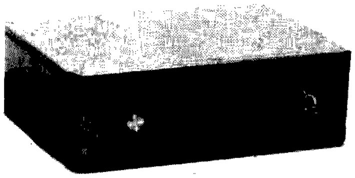

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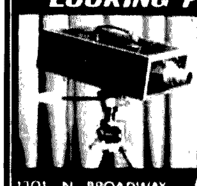

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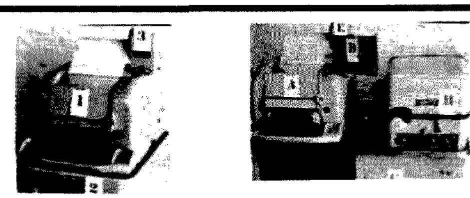

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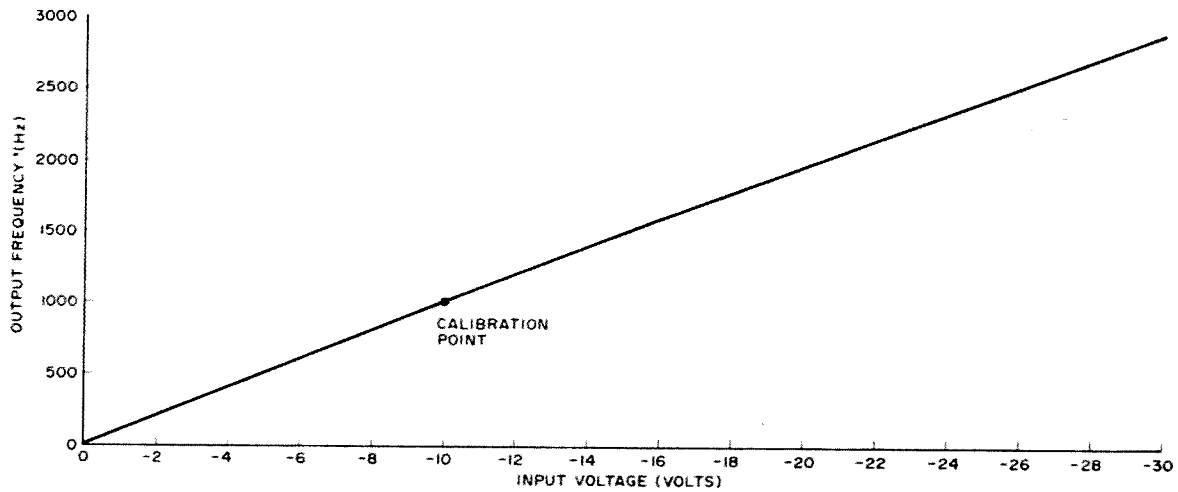


Fig. 3. Graph of input voltage versus output frequency for the circuit of Fig. 3.

discharge time. Since CI discharges in 15 μs for the values given, the discharge time can be considered insignificant in most cases and the following approximation for frequency be made.

$$F = \frac{1}{T} = \frac{\Delta V c I \frac{\text{volts}}{\text{second}}}{\text{V threshold}}$$

Combining the preceding into one formula for frequency,

$$F = \frac{\text{Ein}}{(\text{Ra})\,(\text{CI})\,(\text{V threshold})}$$

when E_{in} and $V_{threshold}$ are in volts, CI is in farads, and R_a is in ohms.

Linearity

The circuit of Fig. 2, was constructed using the component values shown and was calibrated (by adjusting R_a) for 10V E_{in} equals 1000 Hz out. With the input voltage monitored by a FLUKE 8100 digital voltmeter and the output frequency measured with a Hewlet Packard 5223L frequency counter, an input voltage versus output frequency comparison was made. The data from that comparison is plotted in the graph of Fig. 3.

Between the input voltages of -0.1V and -10V, the largest frequency error was +0.3% of the calibration frequency (1000 Hz).

Audio Amplifier

The audio amplifier consists of a differential amplifier (Q2 and Q3) to shape the sawtooth waveform into a square wave and a Darlington pair (Q4 and Q5) current amplifier to drive the speaker. Variable resistor R19 is located on the front of the voltmeter and controls the voltmeter volume. Induced voltages from the speaker which could damage Q4 and Q5 are discharge; by D2. To minimize a drop in volume at low frequencies, direct coupling is used throughout the audio amplifier.

Power Supply

The power supply is made up of one +12V and one -12V zener regulated source and one +18V source. The plus and minus 12V power, the op amps, the test circuit, and the differential audio amplifier. The +18V supplies the audio power amplifier. In the +18V supply, Q6 acts as an electronic filter to eliminate 60 Hz hum from the audio output stage. If a 3-wire power cord is not used, the voltmeter case should be grounded by other means to insure hum free operation.

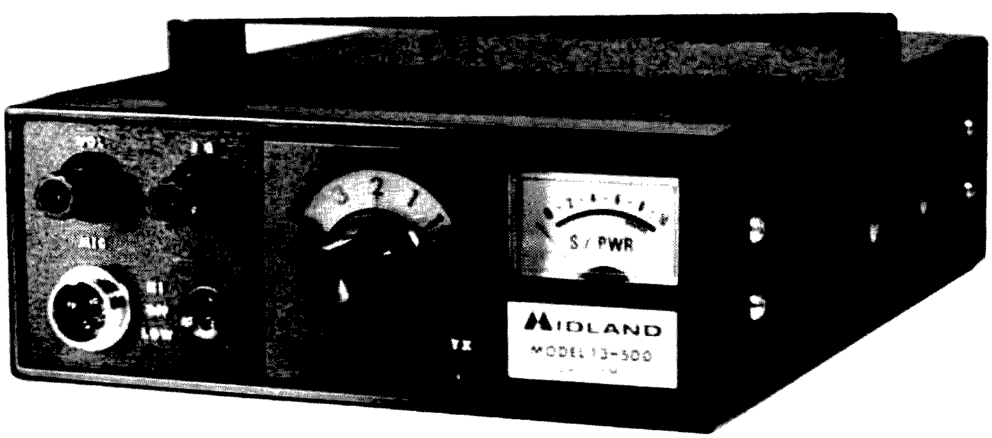
Conclusion

Frequently in troubleshooting, the presence or absence of a dc voltage provides sufficient test information to diagnose the circuit. The audible voltmeter aids the trouble shooter by eliminating the need to keep looking at the test instrument to determine if the desired voltage is present.

. . .WAØAQC/9

Walter W. Pinner WB4MYL
7304 Lorenzo Ln.
Louisville KY 40228

MIDLAND 2 METER BASE OR PORTABLE



The Midland 13-500 144 MHz transceiver is an excellent low priced rig. The transmitter features 1W and 15W power selections as well as automatic SWR shutdown to protect the final. Transmit crystals for 16, 34 and 94 are supplied. On the air audio reports are excellent. Deviation is adjustable and was factory preset to 5 kHz on the unit tested. The front panel incorporates a small transmit indicator lamp, illuminated channel indicator (there are 12 available) and lighted S/rf output meter which is large enough to be read easily. A rear mounted accessory jack is provided for connection to a discriminator meter, tone input, keyed +12V for linear control and ground. A rear mounted external speaker jack is provided which when used disables the internal speaker. Power connections are via a pigtail which incorporates an in-line

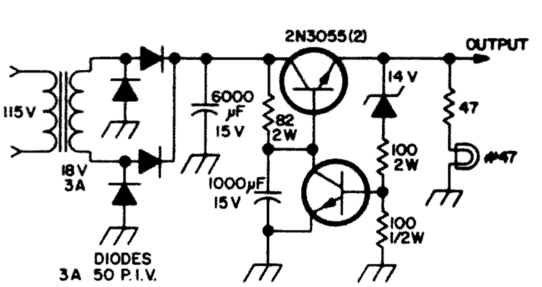


Fig. 1. Base station supply for the Midland 13-500.

fuse holder. Also supplied is a mobile mounting bracket and hardware, plus mic hanger clip, speaker plug, accessory plug and two extra fuses. The owner's manual sup-

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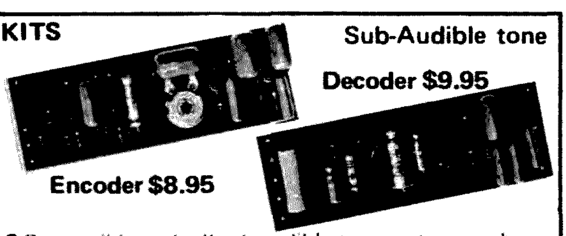

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plied contains a complete schematic and voltage check chart as well as a complete section by section circuit description.

The most exciting part of this little rig is the receiver which boasts a two stage FET rf amplifier, a five section helical resonator filter and a FET mixer. Trimmers are provided on all crystals (transmit and receive) and all oscillators are zener regulated for stability. Receive crystals are provided for 76 and 94.

As unpacked the sensitivity of the receiver was found to be .2μV usable and .3μV for complete quieting. Although the unit is small, the dual back to back circuit board

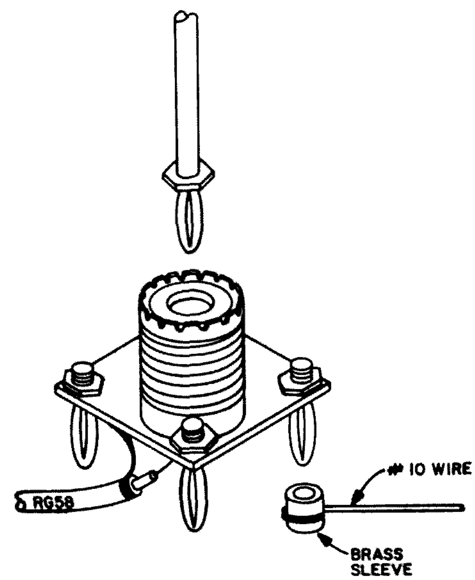

Fig. 2. Antenna for the Midland 13-500.

layout is uncluttered and mechanically sound. The small side mounted speaker has acceptable audio quality and is not hidden when the unit is dash mounted or flat on a table.

An inexpensive base station supply is shown in Fig. 1.

A transformer delivering 18V at 3 amperes is not a common item. Therefore a 12V 3 ampere unit was modified as follows. Select a transformer that has small spaces at the corners of the frame window around the original winding. Add approximately 26 turns of No.20 teflon coated wire by threading it through these spaces. My transformer accepted 13 turns on the top and bottom with no difficulty and when this additional

winding was properly phased the output voltage was 18V ac. My power supply was housed in a small cabinet which also contained a 4 inch speaker and a 50-0-50 μA

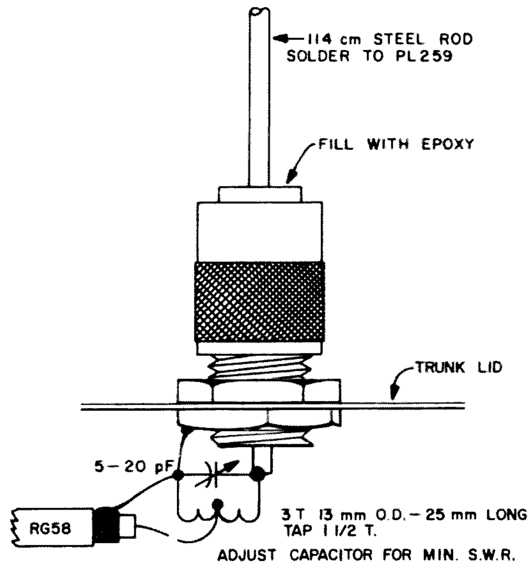

Fig. 3. A 5/8 λ mobile antenna.

discriminator meter. The dial light shown not only illuminates the meter but provides some low load regulation for the supply. Power supply output on receive is 13.2V and 13.0V on low power transmit. High power transmit voltage was 12.7 (measurements made at 117V ac input).

Fold Up Suitcase Groundplane Antenna

Portable operation from motels, etc., may be a little more convenient with the antenna shown in Fig. 2. The elements are No. 10 solid copper wire. These are looped around a 3/8 long piece of 3/16 in. brass tubing. The tubing may be found at most hobby stores. Solder the radials to the tubing. An S0239 connector is fitted to a 2 in. square plate and fitted with four banana plugs as shown. The radials are merely pushed on to the plugs to assemble. The driven element is a piece of No. 10 wire soldered to a banana plug which is then inserted in the center of the connector. A loop in the top of the driven element and a piece of nylon cord will serve to hang the antenna from any convenient location.

Fig. 3. shows details of a 5/8λ mobile antenna constructed from common materials.

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Occasionally you may find that some otherwise desirable piece of surplus electronic equipment is designed for use on 230 volts ac. Unless your ham shack has been especially wired for 230 volts, it will probably not be available at a wall socket. You will have to either replace the 230 volt power transformer with the similar 115 volt unit, or use a step-up transformer to raise the line voltage to 230 volts.

The use of a step-up transformer is by far the simpler method, but unfortunately these transformers are seldom found in junk boxes or at surplus sales. However, a good substitute can be made from readily available junk box type parts by wiring two filament transformers as shown in Fig. 1. In this circuit the isolated 115 volts induced in T2 is added in series with a 115 volt line to get an output of 230 volts (less a slight voltage drop).

The transformer secondary voltage ratings may be any value, but they must be equal. The current ratings probably need not be the same, although the only transformers that I have tried have had identical ratings. The 230 volt output power rating will be somewhat less than twice the power (E x I) rating of the lowest rated filament transformer. For example, if 6.3V, 10A transformers are used, the power rating would be equal to 2 x 6.3 x 10, or 126 watts (or about 100 watts to allow for transformer losses).

The transformers must be phased properly. This is easy to check because if it is wrong the output voltage will be zero. If this happens, reverse the connections to either the primary or the secondary of T2. Since the high-voltage winding of T2 may operate at twice its intended voltage above ground (depending on how the line cord plug is inserted) it would be a good idea to isolate the core of T2 from ground by mounting it on insulated washers or standoffs.

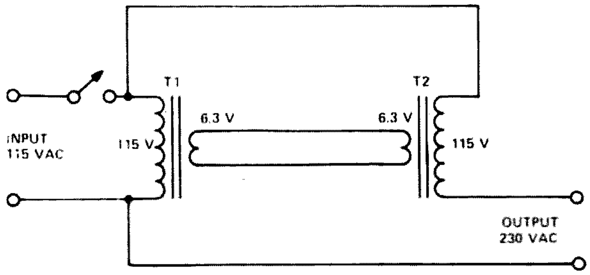
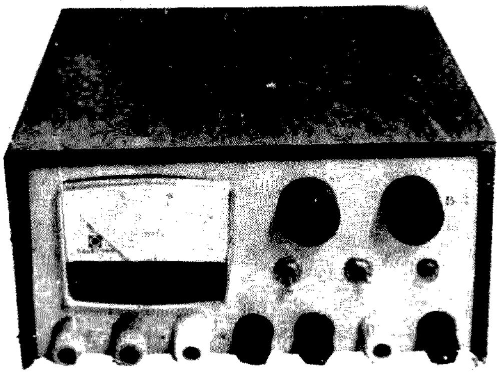


Fig. 1. Circuit diagram of the 115V to 230V step-up transformer.

A switch could be included in the 115 volt ac line, because some current will be drawn from T1 by T2 even with no external load. In my own case, using two 6.3V, 10A transformers, the no-load secondary current of T1 is 3.5A. The transformers supply 210 volts to a 65 watt load, and run only warm to the touch.

. . .K5LLI

Noel Calvin
2683 Buena Vista Way
Berkeley CA 94708



UNIVERSAL POWER SUPPLY

For a long time the line operated power supply has been part of the basic equipment of the experimenter's bench. And up until now a single variable supply has been adequate for most purposes.

But now even the most novice experimenter uses integrated circuits, both digital and linear. And most ICs will operate properly off only certain closely defined voltages. TTL requires +5, op amps ±15, comparators +12, -6. Even for simple circuits using a single op amp a single voltage power supply is inadequate. For more complex circuits combining several types of IC and discrete components, the situation can become impossible if you have only a single voltage power supply to work with.

So what do you do? You can spend a fortune on batteries – you can find another hobby – or you can build the Universal Power Supply for under $50.

The Universal Power Supply is really five power supplies in one: 3 fixed voltage, 2 variable, each one regulated, and each one current limited at 1.5A. The voltages available are +15, +5, -15, variable 0 to -18, and

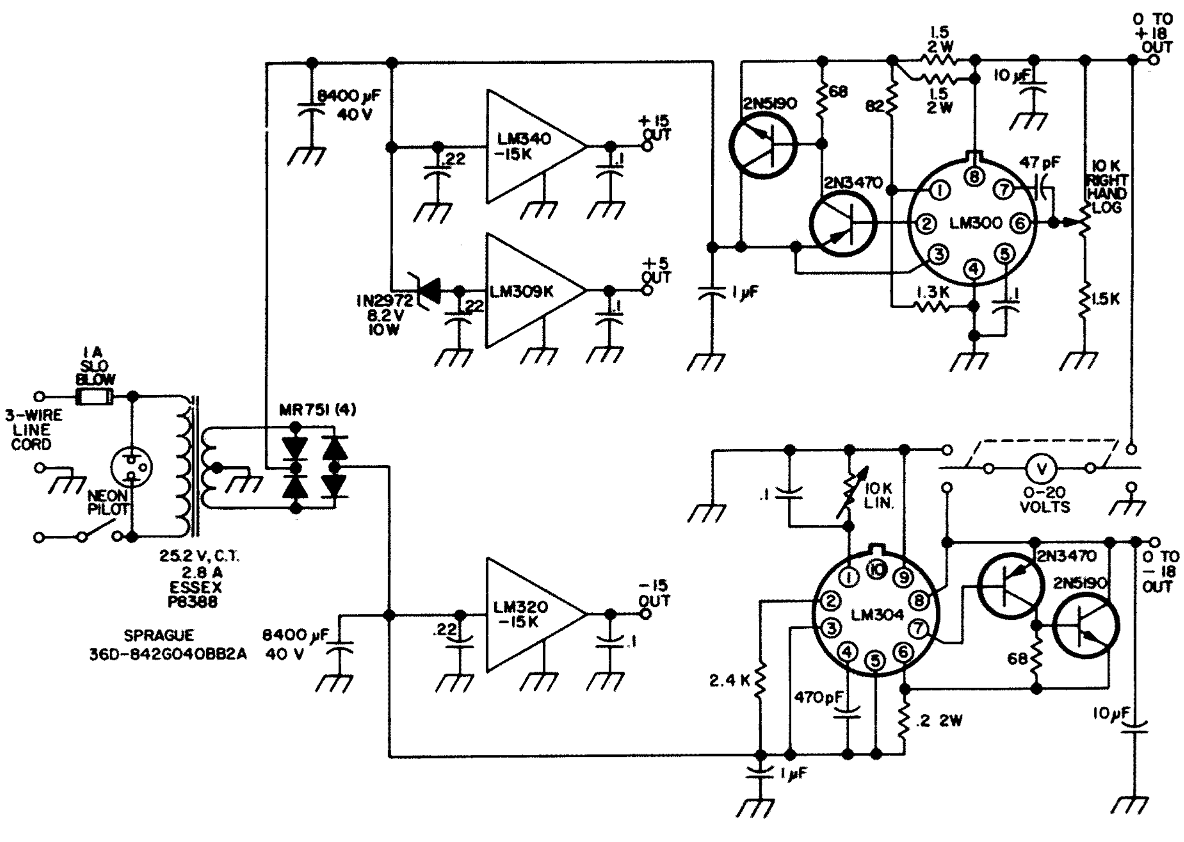
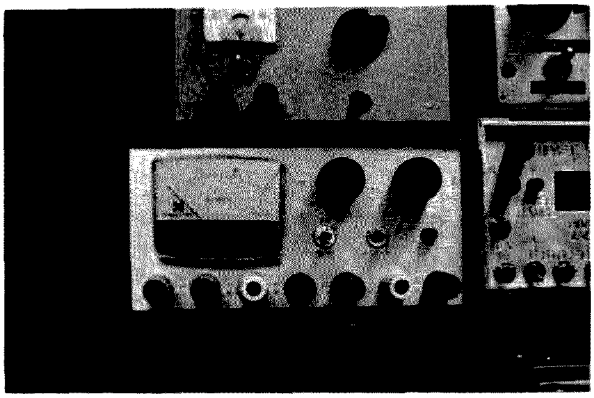


Fig. 1. Universal Power Supply



The Universal Power Supply. It has 3 fixed voltages and 2 regulated. See text for details.

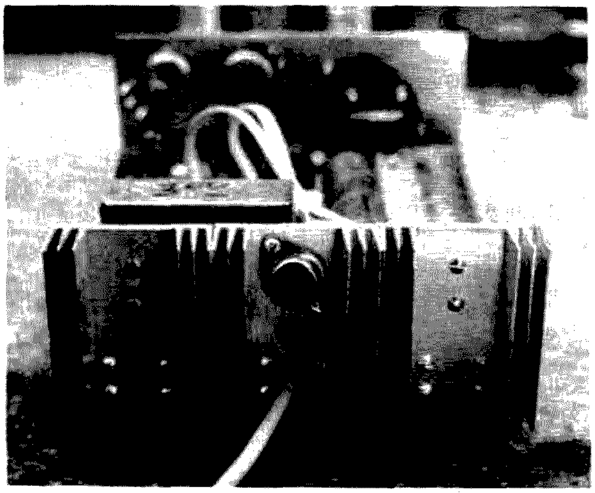
variable +2 to +18. The circuitry uses state-of-the-art integrated regulators so the Universal Power Supply is probably simpler to build than that old single voltage regulated power supply was.

Construction

There are only two rules that need be observed when building the power supply: 1) Provide approximately 60–100 cm of externally mounted heat sink for each fixed voltage regulator and output transistors. 2) Mount the output transistors as close to the IC regulators as possible.

All parts for the variable voltage regulators except the output transistors are mounted on a vectorboard with T-28 terminals, and the interconnections made on the bottom side with wire.

I made the case for the prototype out of aluminum L-brackets, sheet metal and plywood, but any commercial case will do. You may even want to build the power supply into your bench.



The TO-3 case is the 309 regulator. Other regulators were K package and are mounted on the reverse side of heat sink.

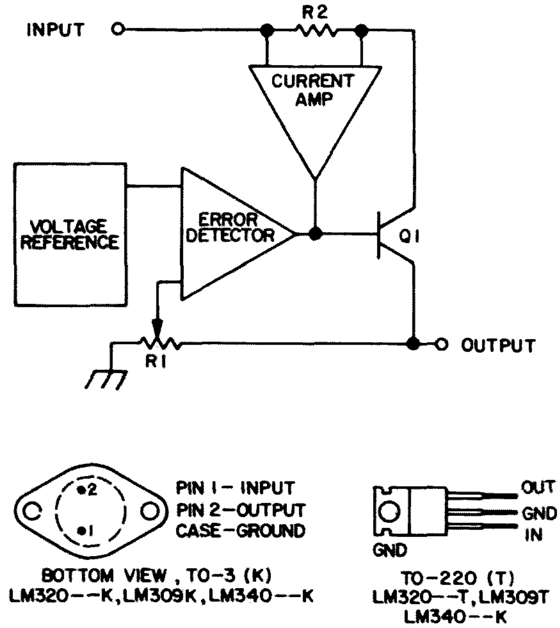


Fig. 2. Block diagram of integrated regulator.

Theory

All the regulators used in the power supply work in basically the same way. The block diagram in Fig. 2, is applicable to all of them.

Operation is simple. The error detector compares a fraction of the output voltage to the reference, and by controlling the drive to Q_1 keeps the output voltage very close to the voltage set by R_1, irrespective of load. The current amp senses the voltage across R_2 which is proportional to the load current and overrides the error detector, cutting the drive to Q_1 when the load current gets too high.

In the fixed voltage regulators Q_1, R_1 and R_2 are all internal, while in the variable voltage regulators they are external.

Specifications

Outputs: +15V ±5% @ less than 1% load regulation, 1.5A; +5V ±4% @ .1% load regulation, 1.5A; -15V ±5% @ less than 1% load regulation, 1.5A; +2 to +18V @ .1% load regulation, 1.5A; 0 to -18V @ .01% load regulation, 1.5A. Input: 115V ac @ 75W maximum.

. . .Calvin

Robert Baird W7CSD
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REVIEW OF GROUNDED CATHODE LINEARS

For the past several years grounded grid linear amplifiers have been all the rage. A grounded grid linear assumes that you have 50 or 100 watts of rf drive available. Lots of hams do have such an exciter. On the other hand, some of the less fortunate ones may have an old 10A or 20A or perhaps they have picked up a bargain SB 10 on the used market. And even others may have picked up a used rig for next to nothing and modified it to DSB. Then there is the QRP ham who has invested in an Argonaut or a single band Justin which doesn't pack quite enough wallop for long haul consistently from home base. All of these point to the need for a linear requiring minimum drive.

With the above in mind, I decided to make a general investigation of grounded cathode amplifiers. I decided to build a skeleton amplifier from an aluminum chassis and two ancient National all-band tuners resurrected from the junk box. The center of the chassis was a hole which would accept a rectangular piece of aluminum on which were mounted different sockets. The National all-band tuners are not at all a must. A simplified circuit with changeable coils will work just as well. Two tubes in parallel could be used instead of two tubes in push-pull and a pi network output circuit might be better than the all-band tuner. If you are going to change bands you either have to have switching or plug-in coils. I hate both and already had the all-band tuners. If triodes are to be used with a pi netowrk output, a split grid circuit would be highly desirable from the standpoint of neutralization.

The Push Pull Triode Linear

Triode tubes in the grounded cathode configuration do not require very much drive even in class B. Class AB requires even less and if you want to go all the way to Class A you don't need any power at all, just voltage. Since I had an SB10 I went the class AB route. Fig. 1, is the circuit diagram used for three different sets of triodes. I used a pair of 25Ts (at least 20 years old), a pair of 100THs and a pair of 811As. If you are old enough to have some 35Ts or Taylor T20s or T40s in the junk box they would work equally well.

The subject of neutralization seems to be a no no with the younger generation. Actually, neutralization shouldn't be this frightening. It's a simple process and once performed on the highest frequency you expect to use will suffice on all lower frequencies. A well neutralized amplifier is very very stable. Look in any handbook for the simple neutralization procedure.

I used a couple of tubular glass trimmers of the screw-in piston variety for neutralizing capacitors. I was a bit doubtful, but at less than 2000 volts they didn't blow up. A couple of metal plates movable with respect to each other will work equally well. Using the SB10 for a driver, I was able to run the 25Ts up to about 200 watts dc (400 watts PEP) with no flattening on the wave shape

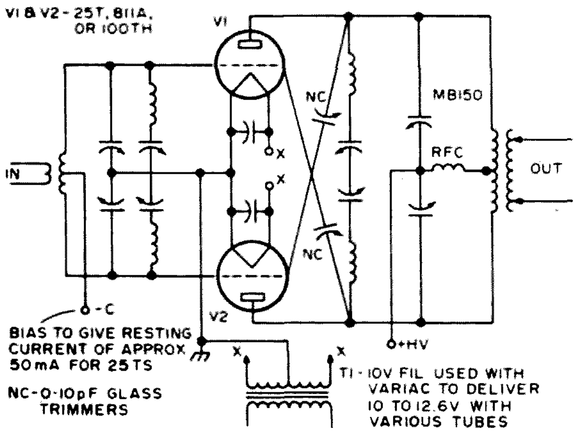


Fig. 1. Triode linear amplifier for SSB.

pattern on the scope. They did get pretty red. Both the 811s and the 100THs could be driven very well to 300 watt dc without flattening. No doubt the 100THs could have gone much higher with a higher voltage. For reasons of economy, as will be seen later, I was limited to 1500 volts.

I never got around to a two tone test with the triodes but the linear waveshape pattern (horizontal Christmas trees) looked great and reports from other amateurs were excellent. Since I was merely repeating that which had been done many times before I had no reason to be in doubt about the linearity of such an amplifier.

I was actually using batteries for bias and certainly a good stable bias supply is required for this kind of operation, not shown in schematic. The parasitic chokes were about five turns of wire 1/2" diameter around a 47Ω 1 watt resistor and were necessary only in the case of the 811As. There was no sign of a VHF parasitic using the 25Ts or 100THs. Of course some other physical arrangement might yield something different.

Tetrode or Pentode Linears

If you jerk out the plate with the triode sockets and replace them with sockets for a couple of tetrodes or pentodes using fixed bias for class AB or class B and with much reduced neutralizing capacity (maybe none at all with certain tubes), the same kind of linear results are to be expected. A pair of 4-65A's, WE 212A'S, RK 20's, or some other similar might be in order. But I do not want to bore you to tears. And I did want to inject something new and different.

The Class "X" Linear

Here's one I ran into down in ZL land. A chap down there told me, "This is really great." "It can't be," I said, "if ever there was a rule its the one that says you must have a rock solid fixed bias supply for a linear amplifier. Whoever heard of grid-leak bias for a linear amplifier?" Well the fact of the matter was that it sounded pretty good. When I got back stateside I discovered the same circuit in Shrader's *Electronic Communication* textbook. Shrader states: *It is interesting to note that the clamp tube circuit can also be used as a linear amplifier for SSB. With no signal there is no drive on the tetrode or pentode amplifier and no grid-leak bias, and the clamp tube clamps the screen voltage to nearly zero. With weak SSB signals applied to the amplifier grid, a little grid-leak bias is produced. This begins to unclamp the clamp tube and the amplifier begins to amplify the input. With strong input signals the clamp tube is completely unclamped and the amplifier is free to amplify normally using grid-leak bias. The clamp tube follows the SSB signal, acting as a gating circuit for the amplifier. This linear amplifier does not require well regulated screen and bias supplies, as do all other rf linear amplifiers.*

I began thinking about this strange combination of grid-leak bias and the clamp tube

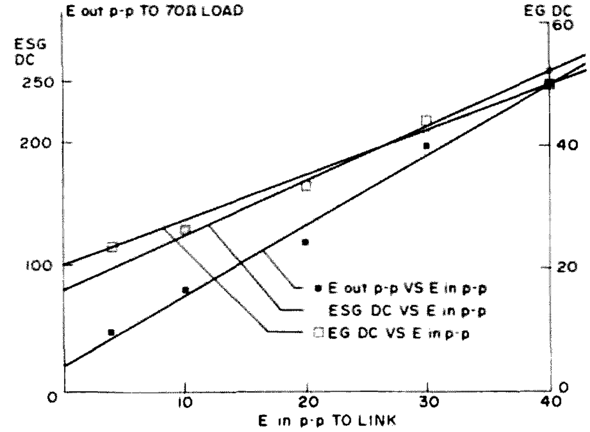


Fig. 2. Class "X" 813 linear amplifier.

and finally decided to give it a try. With a few minor modifications to Shrader's circuit, the results were very encouraging. You cannot call this a class B linear or a class A linear or even a class AB linear since the bias is different for every level of signal. So I

decided to call it the class X linear. The secret to its success is that as the rf input voltage changes the dc grid bias and the dc screen voltages change in a nearly linear manner with it. The result is a reasonably linear power amplifier When I say linear, I refer to the E-out vs E-in curve of Fig. 2, and the fact that the two tone test pattern is pretty good and on the air voice quality is quite acceptable. It is not as linear as a class AB triode. On the other hand it sounds a lot better than a class AB triode with 20 dB of compression as used by many hams on the air today. First of all you get along without a special bias supply. Second you can get along with pretty poor voltage regulation of the HVpower supply. Last, but not least, it is a grounded cathode pentode or tetrode amplifier which requires very little drive.

The 813 Class X Amplifier

Since I had an 813 in the junk box and the 813 has had a pretty good reputation since World War II, I decided to make my class X amplifier using this tube. I pulled out the plate with the four pin sockets and put in another with an 813 socket and an ostal socket for the clamp tube, Fig. 3.

Again, the all-band tuners are not necessary and could be replaced with simple tuned circuits that are switchable or plug-in-able. I removed the former neutralizing capacitors and replaced one of them with a couple of pieces of bus bar (#10 wire). Neutralizing was accomplished by bending the pieces of wire with respect to each other. If you just want to work 75 and 40 meters (possibly 20 meters) you could probably get along without neutralizing at all. The value of R2 and R3 were found by trial and error. These make things a little more linear by providing higher resting current. If you use some other tube you will have to do likewise. Maybe you have 803s in your junk box, or even a 4-250A or something else.

Results

Driving the class X amplifier with an SB 10 (which I scrounged for $20) and an old HT18 exciter which I borrowed (also available for less than $20) I can run the dc milliameter up to cover 200 mA without any flattening on the wave shape pettern. On voice inflections this means about 1500 volts with my power supply. So we have about 300 W dc input which you can translate to 600 W PEP if you like. Even if you discount ham politeness in reporting a little, it is still a pretty respectable signal from the junk box.

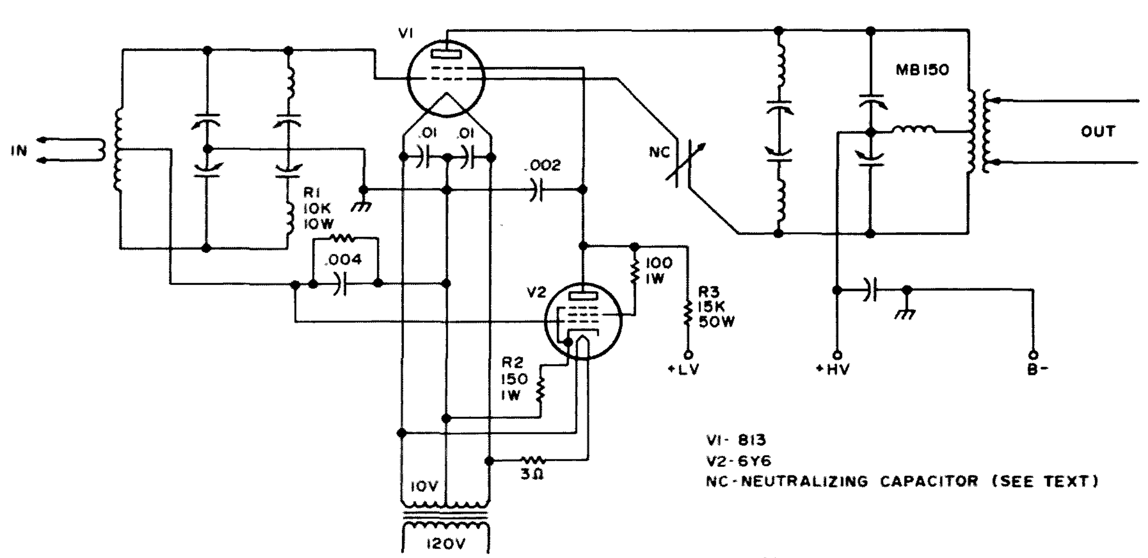


Fig. 3. Class X linear amplifier for SSB.

Power Supply

I have left the power supply (Fig. 4) for last because any 1500 volt supply you might have on hand will work very well. It would be necessary to use a larger screen dropping resistor for the Class X amplifier if you drop all the way from 1500 V. In my case I cobbled up a high voltage supply from

a power transformer liberated from a defunct TV set. A full wave voltage doubler is used with a screen grid take-off from the first half. I am well aware of the practice of building a "stack" rectifier composed of diodes and voltage dividing resistors and capacitors, but in this day and age when you can buy a 1000 PIV diode rated at an amp for 18¢, it is cheaper to put in twice as many diodes as you need and forget about the resistors and capacitors. With a 700 volt secondary the peak voltage is 1000V; so you have 2000V PIV. I just stuck in four 1000V PIV diodes on each side of the doubler and called it good. Filter capacitors and chokes came from the junk box. The 25 μF 2500V job is frosting on the cake and came from surplus some years back. Probably 10 μF would be enough. The spin-off at half voltage for the screen grid seemed like a good idea but is not entirely necessary. I had

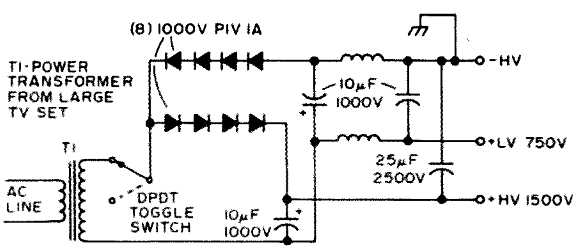


Fig. 4. Power transformer from large TV set.

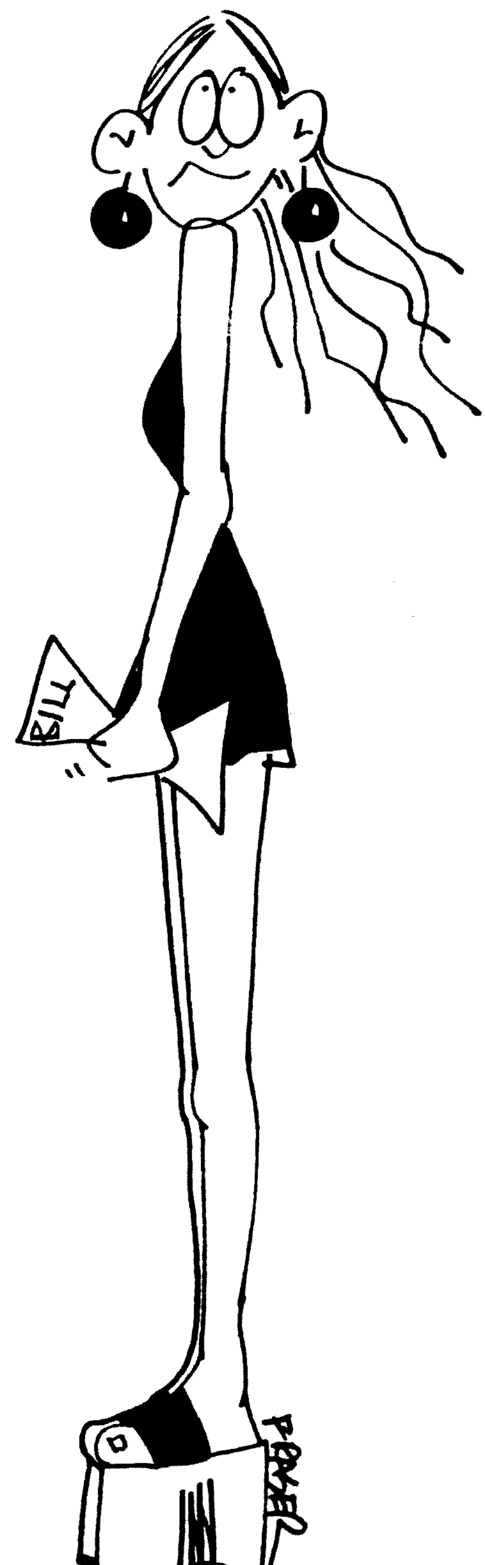
the additional choke and capacitor on hand so I put them in. You could drop all of the way from the high voltage to the screen with a single dropping resistor but it seems like a lot of unnecessary heat loss.

Just to be on the safe side the first time you turn on a new amplifier, it's nice to have a lower than normal voltage avialable. So I put in the SPDT switch to select either half or all of the secondary of the power transformer. It's a nice way to reduce power if you are talking to someone across town.

The supply actually puts out 1750V at a resting current of about 74 mA (plate current plus clamp tube current). It ran a little higher yet with the triode amplifiers, drawing less than 50 mA resting current. With a 250 mA load, voltage drops to something like 1400V. But with the duty cycle of speech, voltage will be 1500V or more.

If you have a low power exciter, try a class X linear.

. . .W7CSD



Be able to smile and look like you believe it when he tells you what a bargain it was !

Don Van Sickle K8GOU
20295 Westpointe Ct.
Southfield MI 48075

SLIDE RULE RULES

Amateurs can and do find uses for the slide rule. Others shun the slide rule, because they find it difficult to deal with decimal points. The following table and rules will simplify this handicap.

Each number is assigned a characteristic as follows:

10000 to 99999	4
1000 to 9999	3
100 to 999	2
10 to 99	1
1 to 9	0
.9 to .1	−1
.09 to .01	−2
.009 to .001	−3
.0009 to .0001	−4

and so on.

To Place Decimal Point in Multiplication:

If the slide extends to the right of the rule add characteristics and place decimal point according to table.

Example	24	x	1.2	=	28.8
Characteristics	1	+	0	=	1

If slide extends to left of rule add characteristics plus 1, thus:

Example	2.3	x	9	=	20.7
Characteristics	0	+	0	=	0+1=1

For Division:

If slide extends to right of rule subtract characteristics and place decimal according to table, thus:

Example	320 divided by 1.8	=	178
Characteristics	2 − 0	=	2

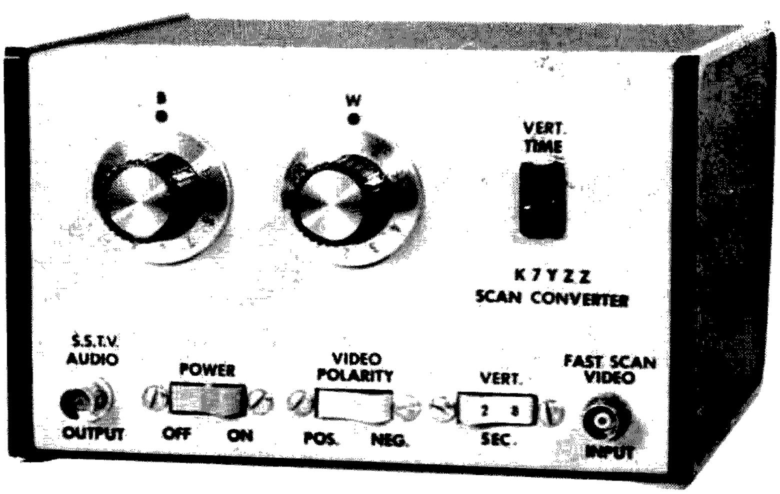
If slide extends to left of rule subtract characteristics and subtract 1, place decimal according to table, thus

Example	288 divided by 8	=	35
Characteristics	2 − 0 = 2−1	=	1

Don Van Sickle K8GOU

Robert Suding W0LMD
370 South Queen Street
Lakewood CO 80226

SSTV SCAN CONVERTER



W0LMD Scan Converter as built by K7YZZ.

The ultimate slow scan enjoyment comes from not just watching Ham TV pictures arriving at your house from across the nation or world, but actually being able to transmit your pictures back. This article describes a technique which allows a person to utilize almost any standard TV camera, from a $50 used surveillance camera to a several thousand dollar commercial camera and special effects generator, with no modification whatsoever to the camera, for transmitting SSTV.

Past Camera Designs

Several techniques have been used in the past to generate a SSTV signal from a camera. The initial effort utilized a special camera with a vidicon designed specifically for SSTV (MacDonald, QST June, July, August 1965). Other amateurs utilized plumbicon tubes in cameras designed to operate at SSTV speeds, with varying degrees of success (Briles, SSTV Handbook, 1972. Suding, Unpublished circuit). The plumbicons were generally used color TV camera tubes. Some even tried using standard vidicons operating at slow scan rates, but with rather disappointing results (Taggart, QST Dec. 1968. Hutton, 73 Feb. 1969).

The most popular method, however, has been the sampling camera. This has taken on several amateur designs (Miller, CQ August, 1969. Stone, Ham Radio July, 1971. Miller SSTV Handbook, 1972). and commercial designs (Robot Research. Venus Scientific). In a unit of this design, a conventional vidicon is operated near standard TV scan rates, and then the picture is progressively sampled for an 8 second period to build an almost identical picture at the SSTV rate (Miller, CQ July 1969).

Unfortunately, while each of these techniques has worked, each also presented problems in operation. Units which operate directly at a slow scan rate are quite difficult to focus and get the shading right. Those camera designs which sample can be viewed at a fast rate, making focusing and aiming simpler, if one is not annoyed by flicker or the need to continually switch scan rates. The "homebrew" sampler designs are particularly vulnerable to interface design problems when trying to connect them to cheaper cameras, and few wished to butcher their high quality industrial cameras for SSTV usage. The need to rotate the camera or TV monitor 90° is a nuisance.

Scan Conversion Concepts

A little discussion of the difference between standard "fast scan" and slow scan may help to clarify the principles of scan conversion. Fig. 1, shows the relationship of fast scan to slow scan.

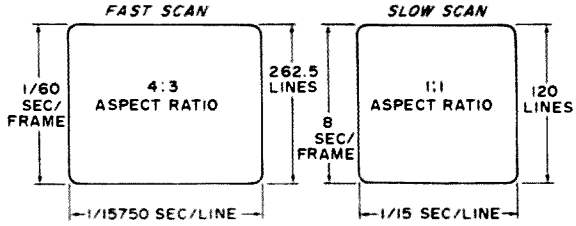


Fig. 1. Comparison of standard TV to SSTV.

SSTV is just TV in slow motion. Speed and resolution are traded off for the capability to transmit pictures on the HF bands due to the decreased bandwidth requirements. 480 complete fast scan frames (considering the interlacing frames as just another frame) will occur in the period of one slow scan picture. Fast scan has over twice as many lines as slow scan, and each of these fast scan lines shoots across the screen a thousand times faster than its SSTV cousin. To make the difference complete, the fast scan picture is wider than high, while the slow scan picture is square. What an incompatible mess for simple conversion!

A few years ago, several amateurs thought that perhaps things were not quite as incompatible as they might appear, and perhaps a special converter might be built which would take the output of the fast scan camera, exactly as it was designed, and, by use of this "scan converter" wind up with SSTV. A few designs were developed during 1972-73, and the resultant designs were explained at some SSTV "state of the art" hamventions in 1973 (Tallent, Dayton Hamvention, 1973. Suding, Cape Cod Hamvention, 1973).

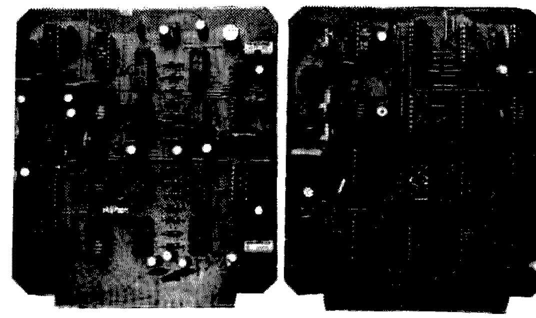
The design of these scan converters (or "line converters" as some prefer to call them) involved taking one complete fast scan line every four fast scan frames. Over an 8 second period, this resulted in the required 120 lines. Since the fast scan line was moving over 1000 times too fast, the video data was slowed down electronically by moving the line of video data rapidly into a small IC "computer memory" chip, and then slowly taking the line of video data out of the memory IC over the four frame interval (1/15 second) which would intervene before the next line sample. An aspect ratio difference was easily handled by electronically throwing away sufficient fast scan video data to have a square block of video data. The apparent incompatibility problems went away, since the conversion circuits simplified to a series of electronic video data disposal units.

Why You Will Now Want to Use Scan Conversion (Even though you used to think you didn't need it).

The major reason for scan conversion is that almost any TV camera can now be used for SSTV transmission with *no* modification whatsoever. The significance of this statement can only be appreciated by those who have tried to modify camera scan rates, eliminate hum, and read untranslated Japanese camera circuits. The video output of the TV camera is simply connected to the scan converter, and SSTV comes out of the scan converter.

Since the camera's scanning circuits have not been touched, the direct video output or the rf video output may be attached to some small TV set to show what the TV camera is pointed at, and allow the operator to make the usual focusing, centering, lighting, etc.,

Scan Converter K7OLO – front view.



Scan Converter boards K7OLO – board 2 on left, board 1 on right.

adjustments. Since there is a horizontal line to horizontal line relationship, the operator is now prevented from getting 90° rotation SSTV neck disease.

Several of us have been beating the bushes for TV cameras, and it appears that used but usable CCTV cameras can be obtained in most major cities for $50-$100. Those wishing to really go "1st Class" can even buy interlaced cameras with zoom lenses and use the same camera for both fast scan TV applications and SSTV. The cost of a complete fast and slow TV camera system, consisting of a used but good camera, the scan converter, and a small transistor TV set monitor can be built for less than the cost of a commercial SSTV camera alone. Besides, you get the pride, honor and glory of saying you did it yourself.

WØLMD Scan Converter

The essential elements of the scan converter are shown in Fig. 2.

The central design element of the scan converter is the one line memory. All of the other functional modules either supply input parameters, or utilize the memory's output, suitably converted. The memory is a single IC, a quad 256 bit shift register.

The video data are quickly loaded sequentially into one end of this IC memory chain and then slowly drawn out of the other end. Obviously the video data movement must be very carefully controlled, so a set of clocks, one running around 5MHz and the other at around 3.5kHz are selected to precisely control this video data movement.

This memory chain is not able to directly respond to analog signals, so special converters change the analog output of the TV camera to a digitized equivalent. The digitized equivalent is then passed down the memory chain like pushing over a string of dominoes, and following speed conversion, finally converted back to an analog signal. This resultant slowed down analog signal drives a voltage controlled oscillator producing the FM tones of SSTV.

A sync stripper separates the fast scan horizontal and vertical sync pulses from the composite video signal coming from the TV camera. These horizontal and vertical sync pulses could be directly brought out from the camera – that's a No-No. No fair taking the covers off the TV camera, remember. These recovered horizontal and vertical sync pulses then control the video data clocking and the conversion processes, and also produce the SSTV timings after suitable frequency division.

As a special bonus, earlier designs of this scan converter have been modified so that the scan converter will operate on either 50 or 60Hz power line TV standards. To select either, a simple jumper plug is utilized, though the jumpers can be hardwired if only 50Hz or only 60Hz operation is needed.

General Construction

Since the scan converter uses rather complex logic switching and ICs not usually seen in amateur designs, PC boards are highly recommended. Since I am definitely not a PC board giant, W8OZA and K7OLO volunterred to do the PC board layout and

production effort. Two different directions were taken on the PC board layouts. K7OLO made a 2 PC board design which he intended to mount horizontally in a small cabinet. W8OZA wished to mount his boards vertically, so he made a slightly smaller set of 3 PC boards. My own prototype is handwired, but I would recommend handwiring only to those possessing considerable IC design and construction experience. There is absolutely no operational difference between the three construction versions.

I would recommend that following a selected layout, the power supply be wired up first so that subsections can be individually tested if the builder so desires.

Most of the wiring is not particularly critical except for the sections running at rather high frequency, such as the clocking section and the A/D converter's output section's run over to the memory. These sections should have rather short lead lengths.

Many parts are not particularly critical such as bypassing 3.3μF and .01μF condensers, but others have been carefully selected. I have placed an asterisk next to those parts whose value should be closely adhered to unless the builder is very sure of what he is doing.

Supply lead bypassing has not been drawn into the circuit, but handwired versions of this unit should heavily bypass the supply lines to ground planes using .01 disk and 3.3μF tantalum condensers in parallel.

Power Supply

The suggested power supply is a simple, low cost unit which provides all of the regulated and short circuit protected voltages for the scan converter. A constructor could use zener diode regulators, etc., in an attempt to reduce cost, but I feel the extra protection given by the 3 terminal IC voltage regulators more than justifies the slight additional cost. Be aware that there is a slight pin difference between the LM340/LM309K and the LM320 as shown. The small 3.3μF tantalums prevent potential regulator oscillations.

Sync Stripper

The sync stripper removes the video component from the composite fast scan video, leaving the fast scan horizontal and vertical sync pulses. The MC1741SC, a high speed version of the standard 741 op amp, inverts the composite video and raises the sync level to a slightly positive level. The diode D101 charges the .047μF condenser to the peak value of the incoming sync pulse. The voltage divider following permits a level to be set which will allow the sync pulse to be cleanly separated from the video. The circuit has an automatic threshold setting ability, and no adjustment is required, even when changing cameras, unless the camera has an extremely poor sync pedestal.

A pair of 74121's function as pulse regenerators and sync separator. The fast scan sync pulses come out clean regardless of the quality of the sync pulses coming from the fast scan camera.

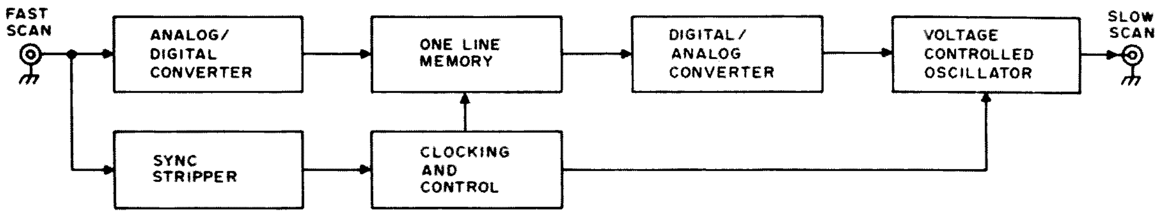
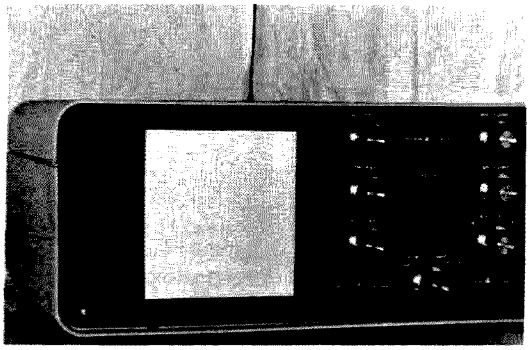


Fig. 2. WØLMD Scan Converter — block diagram.

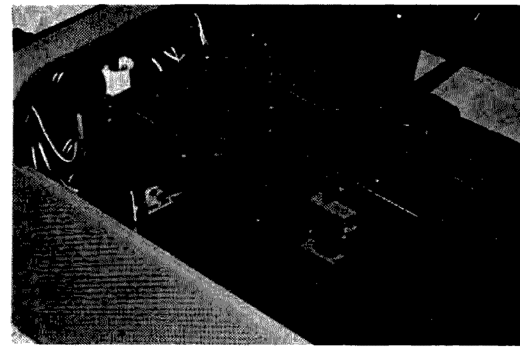
Slow Scan Vertical, Horizontal and Sampling Logic

This digital section is designed so that a maximum of function is accomplished with a minimum of parts and complexity, along with no adjustments. After some critical reviews of previous circuit designs, the included circuitry evolved in such a way that the scan converter operates on 50Hz or 60Hz lines without major changes.

60Hz operation requires that one fast scan horizontal line be sampled every 4 fast scan frames. 50Hz operation will require one



Scan converter and Monitor (W9LUO Mark II) by W8OZA – front view.



Scan Converter and Monitor by W8OZA – side rear view.

fast scan line every 3 fast scan frames. Either way, each line sampled will be progressively lower then the previous line sampled by 2 lines, until slow scan vertical pulse time occurs, at which time the sampling process returns to the top of the fast scan screen. The slow scan horizontal sync pulse is fired at each sample time. The vertical sync pulse is switch selectable to occur after 32, 64, 120 or 128 samples.

The 7492 and the two 7493's function as up counters to detect when vertical sync pulse time occurs. In addition, they function as a "line to be sampled" loader. The pair of 74193's are wired as presettable down counters. Each fast scan vertical sync pulse loads the "line to be sampled" binary number into the down counters. Each fast scan horizontal sync pulse then reduces the count by 1, and when the count goes past the value of "Ø", the line to be sampled is present at the video input to the A/D section. Every fourth time the count goes to Ø for 60Hz or every third time for 50Hz, the sample gate will open for ≈1/15750 of a second to clock the "line to be sampled" into memory.

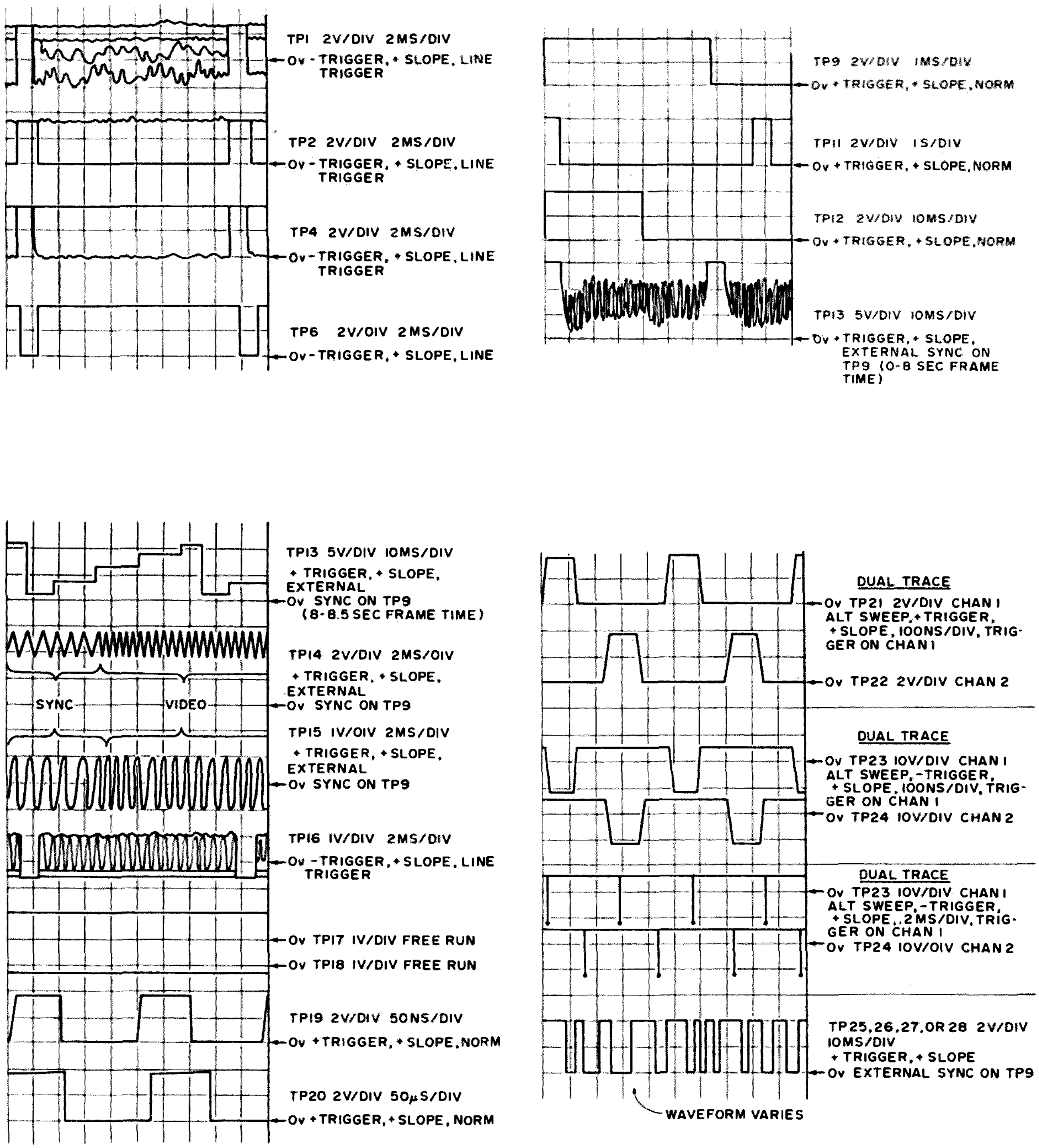
The horizontal and vertical sync pulses are set to about 7ms and 40ms respectively. These slightly lengthened pulses make a tremendous difference in marginal conditions.

A digital readout may be included to show that the unit is, in fact, scan converting, and tell the operator what portion of the SSTV frame is being outputed, useful for starting tape recorders and movement between frames.

Clocking

The clocking section controls the speed at which digitized video is moved in and out of the memory IC. Fast scan video is moved into memory at about a 5MHz rate, and moving this same video out at about a 3.5kHz rate accomplishes the scan conversion and the aspect ratio conversion. The ≈MHz rate actually moves around 300 digital samples into an IC capable of holding only 256. The first 50 or so actually go right out the other end and are lost. About 200 of the 256 digitized video samples which remain inside the memory are then pumped out in the ≈1/15 second that the 3.5kHz clock runs. Obviously, by selecting the appropriate fast to slow clock ratio, the rightmost and leftmost video bytes are lost to produce the 1:1 SSTV aspect ratio from the 4:3 fast scan picture. The faster the fast clock, the larger the leftmost portion of the fast scan frame is omitted. The slower the slow clock, the larger the rightmost portion omitted. Camera non-linearities, spots, blemishes, etc., can be avoided by judicious clock speed settings.

IC217 develops alternating 100ns pulses needed for proper 2 phase clocking of memory. The memory IC utilized requires two elements or "phases" for each clock cycle, one to move data into the memory cells and another to move the data out of the memory cells. The time between successive clock pulses is controlled by either the 5MHz clock or the 3.5kHz clock. The aspect ratio is set by carefully adjusting R224, the 100Ω potentiometer which controls the speed of the slow clock. Set the control so that a round test pattern seen by



OSCILLOSCOPE TEST PATTERNS FROM THE WØLMD SCAN CONVERTER. (TEKTRONIX 465 UTILIZED)

the TV camera comes out round on your SSTV monitor, assuming that the monitor is adjusted correctly, of course.

The ICs and circuits used in this section are a bit unusual. The 7413 is a dual 4 input Schmidt trigger IC which functions very well as an oscillator if a few hundred ohm resistor is tied from its output to one or more of its inputs. A condenser connected between these inputs and ground establishes the oscillation range. Logic circuits hooked to one or more of the input legs can syncronously control oscillation, by going high (>+2V) to allow oscillation.

The MH0026CN (IC216) is a special two phase clock driver by National which converts and inverts the TTL levels of the digital ICs to the MOS clock levels of +5, -12 negative going pulses.

A/D Converter

The analog to digital converter takes the fast scan video signal and converts it to four weighted digital bits, Ø sum value meaning a black signal, and 15 sum value a white signal. The conversion process must operate at a speed of ≈5MHz or better (200ns).

The greater the number of weighted bits, the higher the video quality after conversion. Experimentations by hams and commercial companies have concluded that at least 5 weighted bits (32 shades of grey) are needed for "high quality" video conversion. However, as each digital bit is added, the magnitude of the conversion process at least doubles. For SSTV transmission the quality potential of 5 weighted bits exceeds the potential of the transmission link, so 4 weighted bits (16 shades of grey) were used in this design. I feel the resultant savings in circuit complexity and cost more than justifies the very slight reduction in ideal picture quality.

The A/D converter encodes the video into the Gray code rather than a strict binary powers of 2 code. The Gray code is designed so that one and only one bit changes in any step in shading, thus making glitches caused by sampling at bit change time unnoticeable. The result is a simpler A/D circuit and a vastly improved picture. The 711's are so wired that one section will set the 711 output "on" when a certain input potential is reached, and the other section will turn the output "off" as the value continues to increase beyond a preset point. This 711 characteristic enables an encoding circuit to be built using only 1¼ gates for encoding. The Gray code is explained in most books about digital coding schemes.

The incoming video is fed to a MC1741SC high slew rate op amp (IC201) video driver which drives the 15 comparator stages in parallel. A voltage divider string of 10Ω resistors is tied at either end to a variable voltage source, + at the top end of the string, and - at the bottom. The front "WHITE" and "BLACK" controls are set so that the whitest component of the video will trip shade 15 and the blackest level just fails to trip shade 1. This will give the truest grey scale, but the "WHITE" and "BLACK" controls can be set so that video compression takes place, and an overly contrasty picture may be sent which comes through better under QRM conditions. The simplest way to precisely set the controls is to use the SSTV spectrum analyzer (Suding, 73 Dec. 1972, and SSTV Handbook). TP13 hooked to a dc oscilloscope will work fine too.

Memory, D/A and VCO

The memory section of the scan converter receives the high speed Gray code digitized video output of the A/D converter, and delivers a slowed down version. The output of the memory is converted back into a binary code by Exclusive OR IC213, and then goes through IC214 which allows positive or negative pictures to be sent. Inversion is appropriate to "menu board" operations, since black characters on a white background fare better under multipath conditions.

The D/A converter changes the binary video into an analog voltage. This simple circuit uses an "open collector IC (IC104), a 7405, which shorts a set of 4 resistors to ground, thereby controlling the gain and subsequent analog voltage output at pin 1 of IC105.

The VCO is an IC function generator which produces both a triangular wave and a square wave output. By utilizing the triangular wave output plus the low pass active filter following, an extremely clean sine

wave is generated, even at 1200Hz. The result is extremely "crisp" pictures with few transients, particularly in the zone between the sync and black frequencies.

I would advise using the exact R and C values specified with IC104, IC105, and IC106. Notice that R111 through R108 are in a binary value doubling sequence. The ideal sequence would be 5.5K, 11K, 22K and 44K, so a bit of value selection with an accurate ohmeter will produce a better D/A conversion.

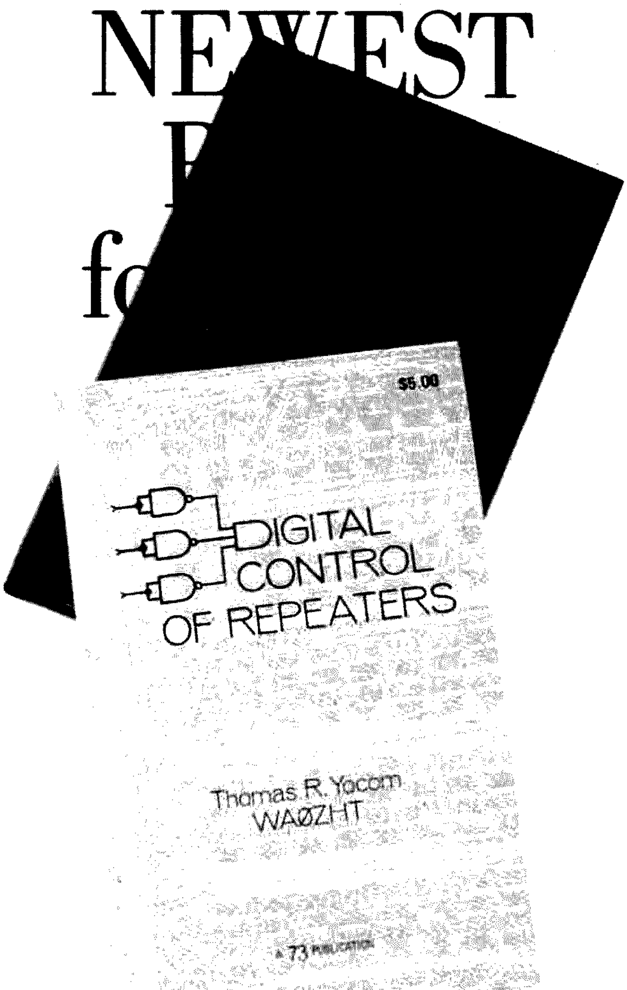
Auto Grey Scale Pattern Generator

The biggest trouble with most SSTV stations is that they never use the full 800Hz video bandwidth that they should be using. A special circuit has been included in this scan converter which multiplexes in a grey scale over the 8 lines at the bottom of a 128 line frame. This grey scale facilitates not only monitor contrast/brightness adjustments, but also helps the scan converter user to adjust the BLACK and WHITE compression controls by comparing the blacks and whites in the picture displayed on his monitor with the grey scale displayed at the bottom of the screen. The grey scale also provides handy marker pulses on the spectrum analyzer or the dc oscilloscope hooked to TP14.

60Hz operation will have 4 shades of grey with the whitest shade appearing at the left side of the screen and the black shade on the right. 50Hz operation will have 3 shades of grey with the whitest shade on the left again, and the black shade on the right.

The circuit is wired so that it detects the last ½ second of each 128 line frame, establishes clock gating pulses, and multiplexes the grey scale with the converted video into the D/A converter. A 7420 (IC309) is used in the up counter section to detect the last ½ second of each 128 line frame, and drive the horizontal sync single shot during this period. The output of IC309 serves as a grey scale gate to the 74157.

The converted video feeds one set of 4 inputs to the 74157. Selected up counter clock pulses are fed to the other set of 4 inputs, designed so that their binary combination will produce the grey scale during the last ½ second period.



Here's the book for every ham who wants to design and build a digital repeater control system (or who wants to just think about doing that). Contains sections on repeaters, basic logic functions, logic circuit design, control systems, support circuits, mobile installations, touchtone, plus a special section on a "mini" repeater control system. 224 pages.

Hardcover **$7.00** *Paperback* **$5.00**

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Enclosed is $ ____. Please send ____ ☐hardcover ($7)/☐paperback ($5) copies of "Digital Control of Repeaters" to:

Name __________________ Call _____

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State ______________ ZIP _______

PARTS LIST

Capacitors

C1, C4	1000 μF, 35V Electrolytic
C2, C3, C5, C6	1000 μF, 15V Electrolytic
C7, C8	3.3 μF, 35V Tantalum – Mallory TAS335K035POC or equivalent.
C9, C10, C11, C12, C110, C111, C114, C210, C211, C212, C216, C217, C218, C222, C223, C224, C228, C229, C306, C307, C308, C309, C310	3.3 μF, 15V Tantalum – Mallory TAS335KO15POA or equivalent.
C13, C14, C15, C16	.001 μF Disc Ceramic
C101, C102, C103	33 μF, 10V Tantalum – Mallory TAS336K010POC or Equivalent.
C104*, C106*, C303*	.047 μF Mylar
C105, C301*	.001 μF Mylar
C107	Mallory TAS475K010POA or Equivalent.
C108*	.01 μF, Mylar
C112, C113, C115, C213, C214, C215, C219, C220, C221, C225, C226, C227, C230, C231, C311, C312, C313, C314, C315	.01 μF Disc Ceramic
C109*	.003 μF Mylar
C210, C202, C203	22 μF, 15V tantalum Mallory TAS226KO15POC or equivalent.
C204, C205	560 pF Mica
C206*, C207*	47 pF Mica
C208*	1.8 μF, 15V Tantalum – Mallory TAS185K015POA or equivalent.
C209*	800 pF Mica
C302	.1 μF Mylar or Equivalent.
C304*	1 μF, 10V Tantalum – Mallory TAS105K010POA or equivalent.
C305*	6.8 μF, 6V Tantalum – Mallory TAS685K006POA or equivalent.

Diodes

D1, D2, D3, D4, D5	1N4002 or equivalent.
D101, D102, D103	1N914

Integrated Circuits

IC1	LM309K
IC2	LM340/12
IC3	LM320/12
IC4	LM320/5
IC101, IC105	1458 or 5558
IC102, IC201 (Motorola)	MC1741SC-P1
IC103	710
IC104	7405
IC106	NE566
IC202, IC203, IC204, IC205, IC206, IC207, IC208, IC209	711
IC210, IC309	7420
IC211, IC303, IC310	7400
IC212	1402 or 2502
IC213, IC214	7486
IC215	74157
IC216 (National)	MHOO26CN
IC217	74123
IC218	7473
IC219	7413
IC301, IC302, IC311, IC312	74121
IC304	7492
IC305, IC306	7493
IC307, IC308	74193
IC401	7447
IC402	7 segment LED Readout MAN-1, etc.

Xfmr, Led Readout and ICs available from Solid State in MO. IC 1-4 available from Godbout CA. IC102, IC201, IC212 and IC216 available from Hamilton/Avnet Electronics 340 E. Middlefield Rd., Mountain View CA 94041.

Transistors

Q101, O301	2N5134etc.
Q102	2N5138etc.

Miscellaneous

F1 – 1A Fuse
S1 – SPDT Switch
S2 – SP 4 Position Rotary Switch
S3 – SPST Switch
T1 – 24V Center Tapped, 1A transformer
IC socket – as desired
* – Value considered somewhat critical for proper operation.
△ – See text for further explanation of precise value.

Resistors (¼ watt, 5%)

R1	2m
R2, R4	1M Pot
R3	47m
R101	
R102, R110△, R120*, R301*	12k
R103, R117	2k
R104	3.3k
R105, R216, R303	470
R106, R221*, R222*	3.9k
R107, R124*	4.7k
R108△	43k
R109△	22k
R111△ R113, R126	5.6k
R112	1k
R114	5k PC Pot
R115	10k PC Pot
R116*, R305*	8.2k
R118	5k PC Pot
R119*	1.2k
R121*, R123* R125	10k
R122	4.3k
R201, R202, R203, R204, R205, R206, R207, R208, R209, R210, R211, R212, R213, R214	10
R215, R223	100
R217, R218, R219, R220, R226, R227, R228, R229, R230, R231, R232, R233	3.6k
R224	100 PC Pot
R225*	160
R302, R306	1.8k
R304*	27k
R307	220
R401, R402, R403, R404, R405, R406, R407, R408	200

PC boards:
3 board version – drilled – $30 ppd. W8OZA – Russ Sievert, 1411 Lonsdale Rd, Columbus OH 43227.

2 board version drilled – $30 ppd. Undrilled – $20 ppd. K7OLO – Jim Oldaker, 2930 Sorrel Way, Eugene OR 97401.

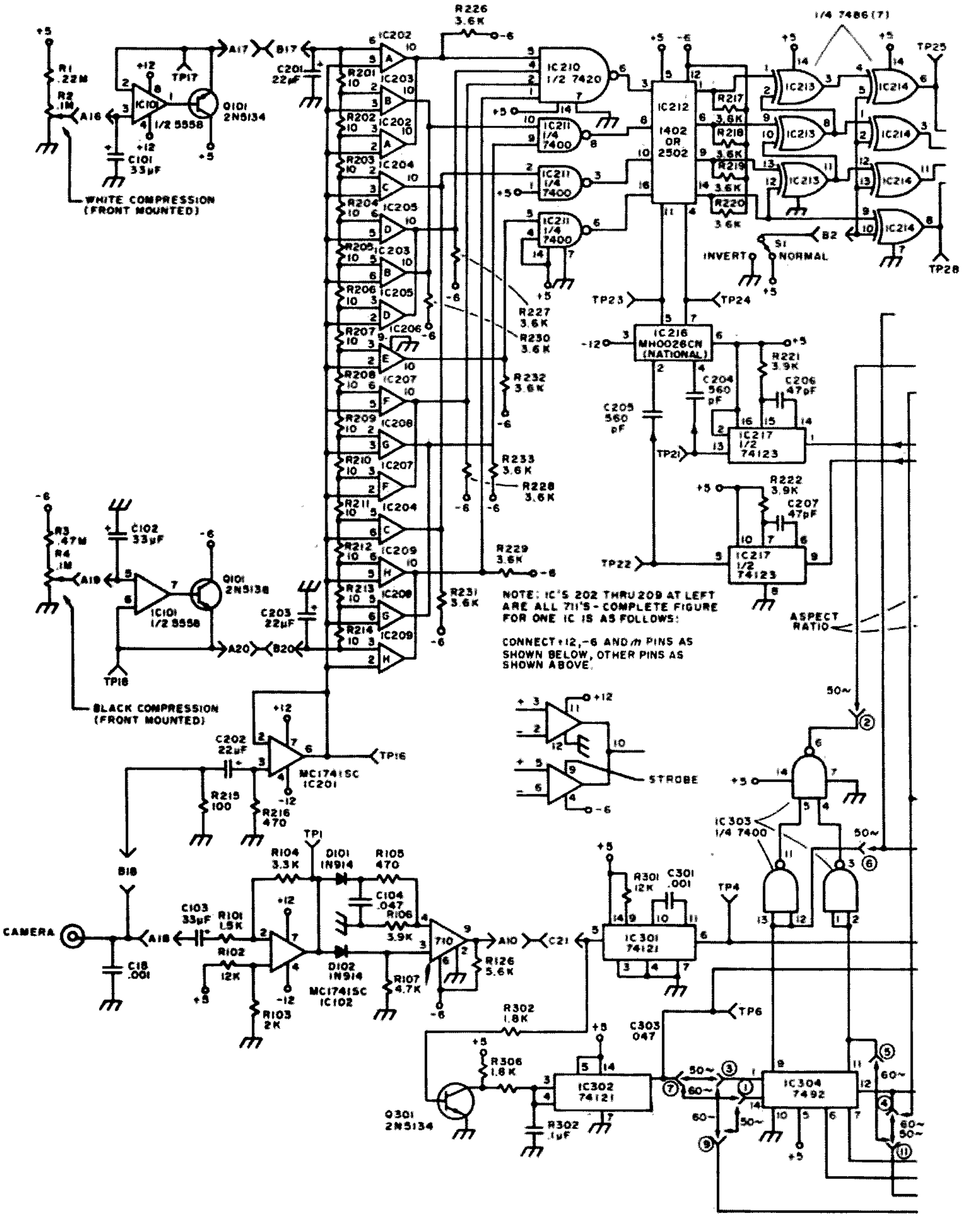
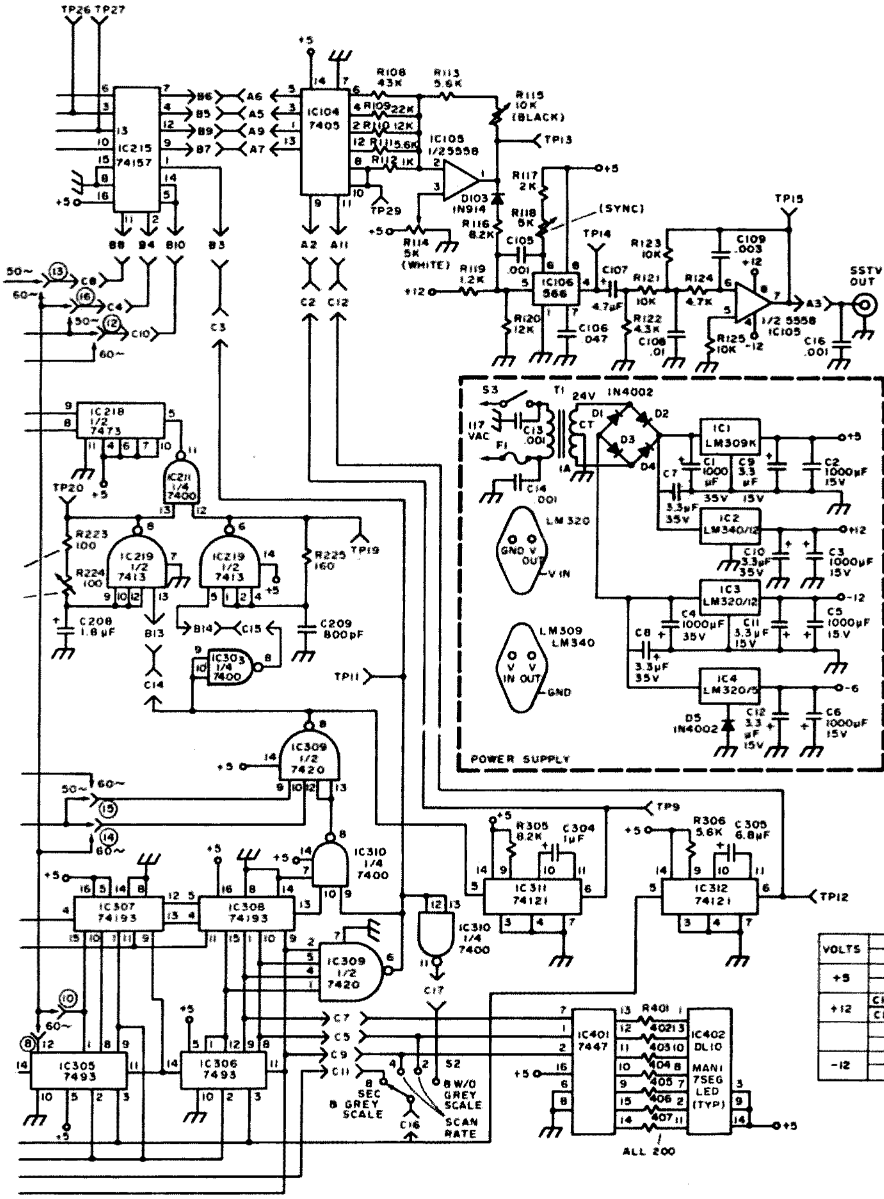
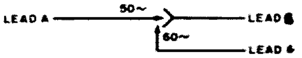


Fig. 3 WØLMD SCAN CONVERTER



VOLTS	PRINTED CIRCUIT BOARD			VALUE
	A	B	C	
+5		C210-C212	C306-C310	3.3µF 15V
		C213-C215	C311-C315	.01µF
+12	C110-C111	C216-C218		3.3µF 15V
	C112-C113	C219-C221		.01µF
	C114	C222-C224		3.3µF 15V
	C115	C225-C227		.01 µF
-12		C229-C229		3.3µF 15V
		C230-C231		.01 µF



50/60Hz Connections

A single schematic, Fig. 3, is included which uses special notation to show how jumpers are connected to run on either 50 or 60Hz lines. Obviously, connect only the labeled set which is appropriate to your situation. Be sure to put in all of the needed 50Hz or 60Hz jumpers associated with IC304, IC305, IC309 and IC215. The PC boards available through either K7OLO or W8OZA have the necessary jumper spots brought to a common socket, and a 16 pin plug is used for the needed jumpers.

Testing

The scan converter may be tested sequentially by inputting video from a TV camera and looking for the included oscilloscope patterns at the test points indicated. The sequence to follow is the functional sequence followed by the section titles of this article.

Only four adjustments are found in the scan converter. Three of these set the key VCO frequencies of 1200, 2300 and 1500Hz. The easiest way to get this section initially on frequency with no camera input is to:

1. Attach a frequency counter to the SSTV output.
2. Disconnect the 1N914 (D103) lead going to pin 1 of IC105.
3. Adjust the sync pot (R118) for 1200Hz output. Reconnect the 1N914.
4. Place the video inversion switch in the "invert" position.
5. Adjust the "white" control (R114) for 2300 Hz.
6. Place the video inversion switch in the "normal" position.
7. Adjust the "black" control (R115) for 1500Hz.

Later adjustments are even simpler once the above "ball park" adjustments have been made. With no video input, ground TP29. Adjust "sync to 1200Hz. Remove ground, switch to "invert" and adjust "white," then switch to "normal" and adjust "black." The sequence 1200, 2300 and then 1500 is necessary to avoid control interaction. The VCO circuit is designed so that once these video limits have been calibrated, no video excursion will exceed the allowed 1500-2300Hz video band.

.The remaining adjustment is the aspect ratio control which is adjusted for a resultant square SSTV picture with video input to the scan converter, as previously stated.

Operation

Once the scan converter is operating satisfactorily, the only adjustments ever touched are the "black" compression and "white" compression controls on the front. Adjust the beam, target and focus controls on your TV camera for as sharp and contrasty picture as possible. At this point you should see some kind of a scan converted picture on your SSTV monitor. Adjust your monitor controls so that the black section of the grey scale pattern is just barely black on your monitor, and the white section is not overly white. The correct setting of your monitor brightness and contrast controls will then allow you to very clearly see the 4 shades of grey at the bottom of the screen (assuming you have the scan converter frame timing selector switch to "8 seconds + grey scale" position.

Now adjust the "white" compression control so that a white area in the SSTV picture just matches the intensity of the white pattern, and adjust the "black" compression control so that blacks in the picture area just match the black pattern. For the truest grey scale rendition, you should avoid the evident pure black or pure white in your picture. However, for greater "punch" in QRM or weak conditions, advance the "black" and "white" compression controls for considerable black and white clipping. Color pictures can come out very well by proper black and white compression. I can't stress the value of the spectrum analyzer too much.

Credits

I would like to thank the large number of SSTVers who have helped with the design, evolution and testing of this scan converter. I would like to particularly thank George Kinder, W8OZA, K7OLO, W6MXV, W9NTP, K7YZZ and WA7MOV.

...WØLMD

Emil E. Hrivnak W3HPX
19 Windmill Road
Enfield CT 06082

HOUSE CLEANING
The Logical Way

Here are some basic techniques to help you with what seems at times to be absolutely mindboggling circuitry.

Every profession has its tricks of the trade which makes things easier, such as the fisherman knowing what bait to use and the right depth to fish at for a particular catch, or a farmer knowing the best planting time and the right fertilizer to use, or an rf design engineer knowing the best LC ratio for a pi-tuning network. Most amateurs are not well versed in all fields of electronics but by some magic combination we get our circuits to work. Knowing a little more about the tricks of the trade could have made things much easier though. I'd like to present some digital guidelines practiced by most digital designeers in hope of making your next digital piece of gear easier to design and quicker to check out and put on the air.

Since most articles appearing in ham magazines are using TTL logic, because of its wide availability and low price, I'll direct my comments accordingly. However, no matter what logic family you use the same basic techniques apply.

The most common abuse in TTL circuits is to leave unused inputs to gates, flip flops and counters floating. Unfortunately, many TTL devices will operate with a floating input, but they are very noise susceptible and you're asking for unreliable and intermittent operation with the high intensity rf fields present in the average shack. A 1K pull up resistor to VCC on those input lines and a .001 μF capacitor to ground on inputs coming from the outside world, such as a key input to a keyer, will cure most problems encountered in home brew digital equipment. No TTL manufacturer recommends leaving unused inputs to gates or flip flops floating. Depending on the logic state desired, they should be grounded or pulled up to VCC through a 1K resistor. A single resistor can handle from 15 to 30 unused inputs. It's not necessary to use a separate resistor for each. They could be tied directly to VCC if you can guarantee that VCC will never transient above 5.5V. Manufacturers claim that inputs above 5.5V may damage

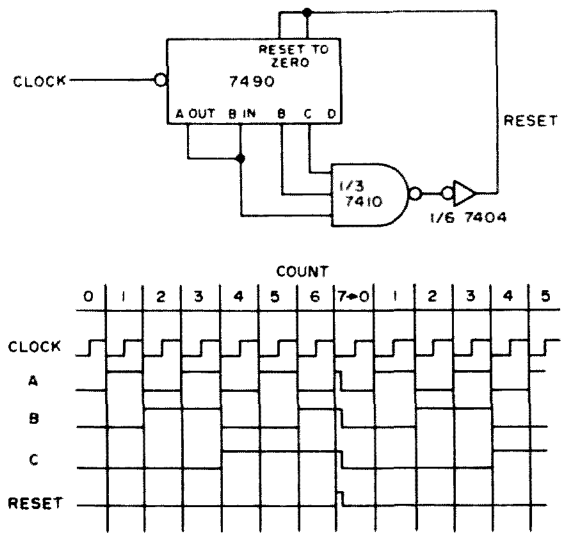


Fig. 1. A typical ÷ by 7 circuit.

the junction. Why risk it? It's safer to use a 10¢ resistor that provides current limiting than to trust your regulator not to overvoltage on a load transient.

Racey Resets

Another area where trouble can develop is in resetting counters. A 54/7490 is a decade counter. If we have a need for a divide by 7 counter we might use the circuit in Fig. 1. This circuit is usually satisfactory but now consider Fig. 2, a divide by 77 counter using two 7490's. The reset pulse is high at count 77 only until the first of the 6 inputs to the 7430 gate goes low. If the units and the tens counters are not matched as to the minimum required reset pulse width, the units counter, for example, could get reset causing the reset pulse to go away before it was up long enough to reset the tens counter. Don't always believe the typical times for reset widths, propagation delays, etc., in the spec sheets. TTL manufacturers

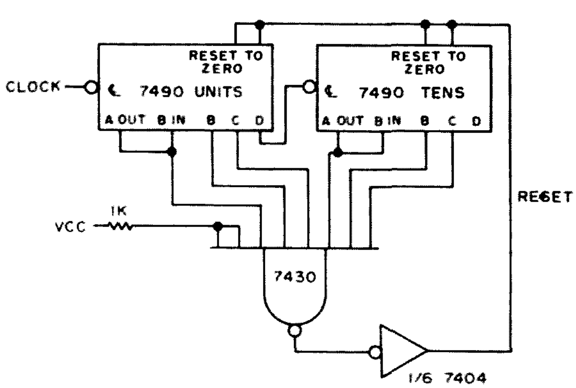


Fig. 2. A typical ÷ by 77 circuit.

sell most all devices they make and some are much faster than the typical values, and some just squeak by the slowest times listed on the sheets. And, by the way, look at the guaranteed numbers again on the spec sheets. They are valid only for 5.000V and 25° C. Over temperature and voltage limits lab measurements have shown that a 2.7 to 1 multiplication factor can be applied to the typical values. Because of these factors I have seen the reset circuit in Fig. 2, fail occasionally on strings of 2 counters and very frequently on strings of 3 or more counters. By adding a latch consisting of two nand gates to the reset circuit you can guarantee a good reset everytime. Fig. 3, shows the additions necessary. The reset pulse will always be ½ of a clock period wide, and at the highest clock rate you can use the counter, the reset will always be wide enough to do the job.

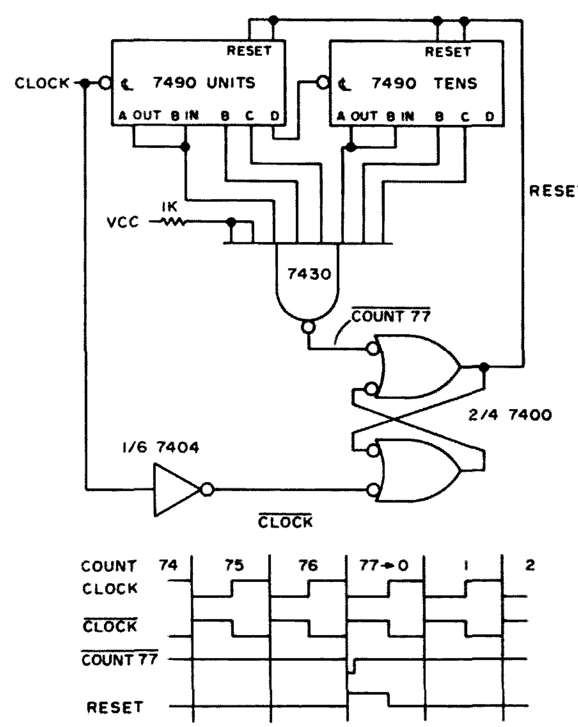


Fig. 3. A ÷ by 77 circuit with a clean reset.

I hate to even mention the following because it leaves a sour taste, but. . .some designeers(?) would have been tempted to use a RC filter on the reset line to lengthen the reset pulse, see Fig. 4. A TTL gate has a lower impedance when pulling to ground than when pulling to VCC. Gate A pulling to ground will discharge capacitor C relatively fast making reset go high. When the first of

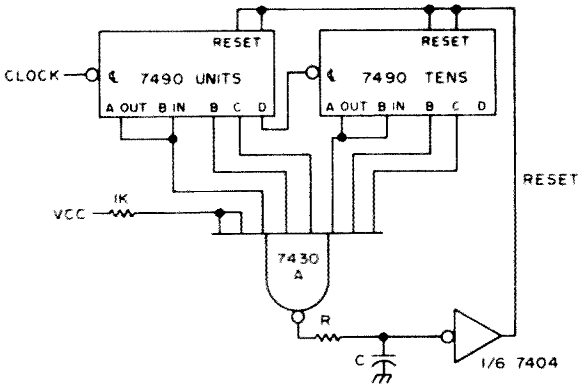
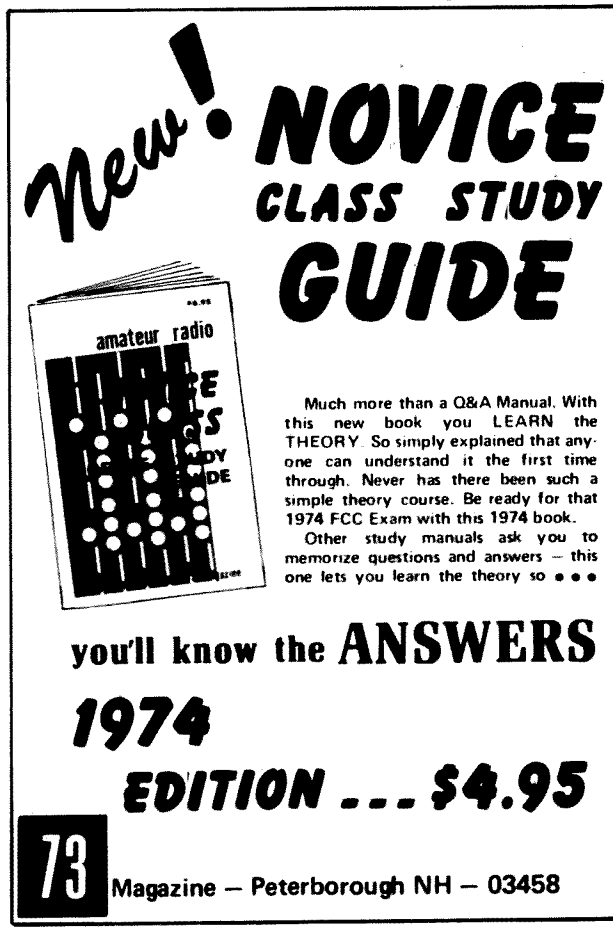


Fig. 4. The way not to lengthen the reset pulse for a ÷ by 77 circuit. RC networks are a no-no in digital circuits.

the counters responds to the reset and gate A goes HIGH, it does not charge up the capacitor as fast. The reset pulse is lengthened some. This is a bad design practice especially in critical circuits, because the time constant is not reliably predictable. Digital gates were not designed to be operated this way, and I have seen the outputs of gates blown because the C was too large and the R too small and the junction couldn't take the transient surge when trying to discharge the capacitor. You should never have to resort to a RC network; there is always a way to do it RIGHT! I don't know of a professional digital designeer that would even consider a RC network in a circuit. Resistors are used only for pull ups, and capacitors are for bypassing VCC to ground!!!

Power and Grounds

There are several ways of supplying power and ground to the chips which are satisfactory. I don't think anyone is capable of saying which is the 100% best way, but good practice is to establish a single point ground and a single point VCC location in the supply section of the equipment. Each card or group of ICs should have separate VCC and ground leads back to the supply terminals as shown in Fig. 5. This single point ground is probably the best place to establish chassis ground. If you have displays or lamps, don't ground them to the chassis, but use a ground wire back to the single point ground. The more bypass capacitors across VCC to ground the less noise there will be in the circuit. A .001 μF capacitor for each 3 chips or a .01 to .1 μF capacitor for each 5 to 6 chips will help reduce noise on the VCC line due to the large current spikes drawn when TTL outputs switch logic states. And keep those leads on the capacitors short, not 3.81cm (1½") as they come from the factory. That 3.81cm (1½") lead looks very inductive at the frequency of the noise you're trying to filter out, and the



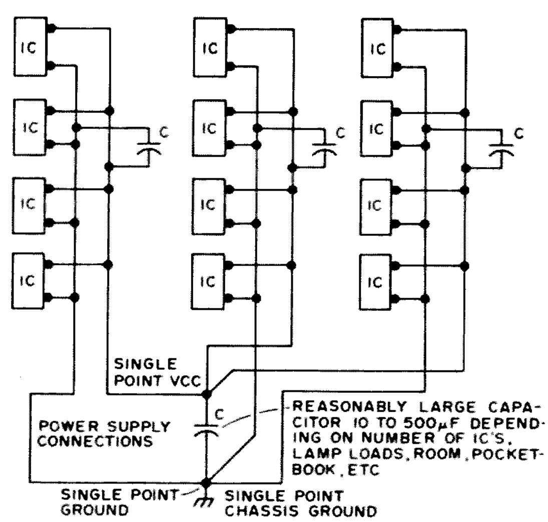


Fig. 5. A preferred method of powering ICs.

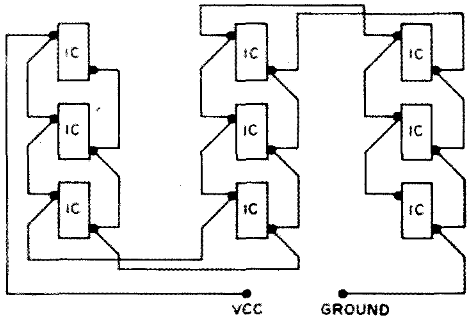


Fig. 6. How not to power ICs. A digital clock powered this way failed to operate properly.

effect of the capacitor is lost if the leads aren't short. A few electrolytics or tantalums, 2 to 50 μF, are always helpful, too.

Don't power your chips as shown in Fig. 6. I purposely wired a digital clock this way to see what would happen and it counted erratically everytime the furnace went on, the electric igniter in the gas clothes dryer went on, the dehumidifier went on, and worst of all anytime the transmitter was turned on. Cleaning up the power and grounds as indicated in Fig. 5, cured all the problems.

Synchronous Circuits

The best advice given to me and that I can pass along to anyone tinkering or starting in digital design is to avoid the use of presets and clears on flip flops except when absolutely necessary. These cases may be when a manual reset is needed to initialize a system after power turn on, or to force a system shutdown, or in synchronizers (an example later) where the preset or clear pulse is synchronous with the system clock. Use other than this can sometimes lead to difficult to find race problems. Bringing in inputs directly to presets and clears of flip flops is the most noise susceptible thing you can do. A noise pulse can easily trigger a part of the circuit. The best design is a synchronous design where all flip flops are clocked together from a common system clock. All next states for the flip flops are defined by the logic circuitry. A typical 7474D type flip flop has a setup time of 15ns. This means that next state information must be present and stable at the D input 15ns before the clock rises. If noise is strong enough to get into the logic circuit it can only affect operation if it occurs within the 15ns window prior to the clock edge. Actually all gate delays from the point of the noise injection up to the D input must be added up, but even in a typical system if the noise is gone 50-70ns before clock it won't cause problems. The probability of noise hitting this narrow window is much smaller than the 100% probability of a noise pulse presetting or clearing a flip flop if these inputs go directly to the outside world.

Race or Initial Conditions

If your digital circuit looks like it should work on paper, but doesn't when you build it, (and all wiring mistakes are out) it could be a race condition. You could have a timing or decoding spike which is triggering another part of the circuit at the wrong time. That's why it's best to clock all flip flops from a common system clock, rather than through levels of logic decoding where propagation delays of gates can generate spikes on an output. Fig. 7, shows a divide by 100 circuit using two SN74160 synchronous decade counters. The carry out of the units counter is high only when it has reached a full count of 9. It enables the tens counter to advance on the next clock pulse, and at the same time the units counter will go to the zero state. Count 19 is decoded and gate X goes

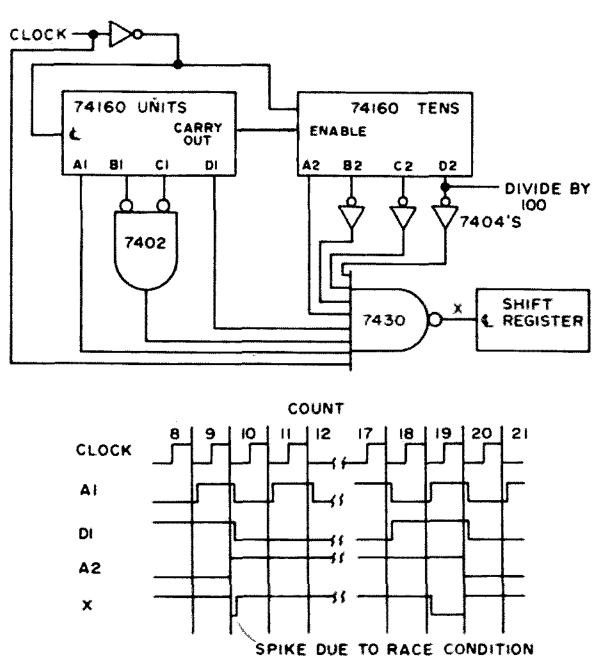


Fig. 7. Illustration of race in a digital circuit. Spike on gate X at counter transistion from state 9 to state 10 causes incorrect clocking of shift register.

LOW when the counters are at state 19. When they are clocked again to count 20, gate X will go HIGH clocking the shift register. The shift register is supposed to be clocked only once for each 100 input clock pulses to the divide by 100 counter, and for purposes of this example, it is to be clocked when the counters go from state 19 to state 20. If the two counters are not matched as to propagation delays, the outputs of the tens counter could change first, and at the transition from count 9 to count 10, A2 could go HIGH looking like a 19 decode before A1 and D1 go LOW really making a 10 decode. A short spike could occur on the output of gate X, long enough to clock the shift register, but short enough that you won't see it without a good high frequency scope. The possibility of this spike occuring increases if the tens counter is very fast, and the units counter just passed the slowest delay times allowed by the manufacturer for the device. Changing the circuit to that of Fig. 8, will cure the race problem. When system clock goes LOW gate X is disabled. The counter is clocked 1 gate delay later and then there is ½ of a bit time to allow the inputs to gate X to setup and decode state 19. Then clock goes HIGH making gate X go LOW. When clock goes LOW at the end of the bit time both the counter and the shift register are clocked together, and gate X is disabled again for ½ a bit time to allow the other 7 inputs to gate X to settle again. The shift register will be clocked once and only once on the transition of the counters from state 19 to state 20 and the race is over.

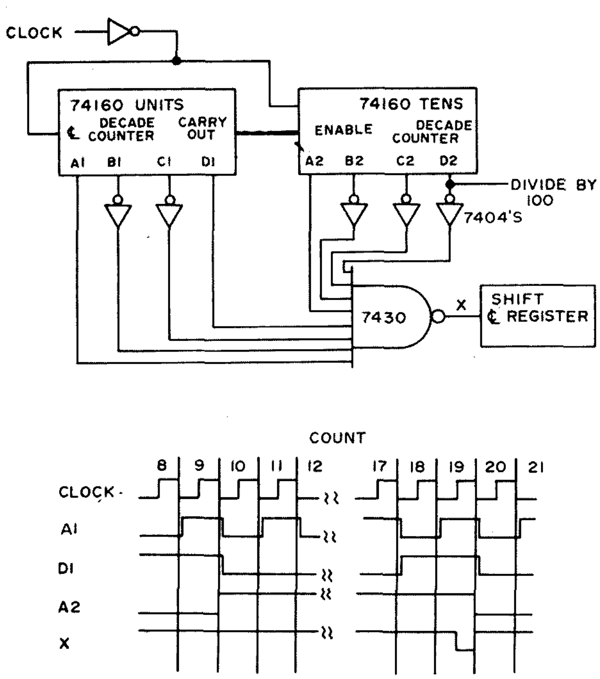


Fig. 8. How to clean up the race condition of Fig. 7.

If your circuit usually works but every time you turn it on it malfunctions for a short period of time, you probably have failed to check that all initial conditions that you thought were there are satisfied. Take a good look at the circuit and try to see what would happen if some flip flop didn't start in the right condition you assumed it would.

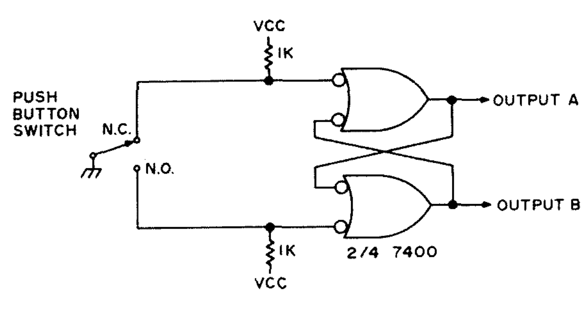


Fig. 9. Switch debouncer circuit. Output A goes LOW when switch is pushed. Output B goes HIGH when switch is pushed.

ANNOUNCING

THE NEW MODEL HCV–70FSVFK SLOW SCAN TO FAST SCAN VIEWFINDER MODIFICATION KIT FOR ROBOT*70 & 70A SLOW SCAN TELEVISION MONITORS

NOW – HERE AT LAST – From the Designer of the TEEC HCV–1B SSTV Camera and the HCV–2A SSTV Monitor and other Slow Scan TV Equipment (WB4HCV) comes another quality SSTV product . . .

This kit, when properly installed in the ROBOT* Model 70 & 70A SSTV Monitor, will allow Fast Scan (Sampling rate of Model 80 & 80A or the HCV-1B Camera) viewing on the same CRT display you now watch slow scan on, by a simple flip of a front panel switch. Viewing the scene in real time allows for quick, easy set-up of scene. Allows for razor sharp focus. Displays movement and a picture 10-15 times brighter than the normal p-7 slow scan picture. Allows slow scan to be transmitted while viewing the picture on fast scan.

Simple, easy to assemble kit of parts and full instructions. Nothing else to buy. Save $180.00 by ordering your HCV 70FSVFK Fast Scan Viewfinder Kit today, instead of a separate monitor to take up more space. You will not only save $180.00 but you will have the advantage of having both monitoring features in a single cabinet. Picture quality equal to model 60 & 61 viewfinders.

PRICE COMPLETE POST PAID IN U.S.A. **$59.95**
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Watch for the HCV-3KB Slow Scan TV Keyboard coming soon. Write for information on reserving yours now. Also – the new improved HCV-1B SSTV Camera and the HCV-2A SSTV Monitor will againg be available in the near futrue. Write James Thomas, WB4HCV, for full information at:

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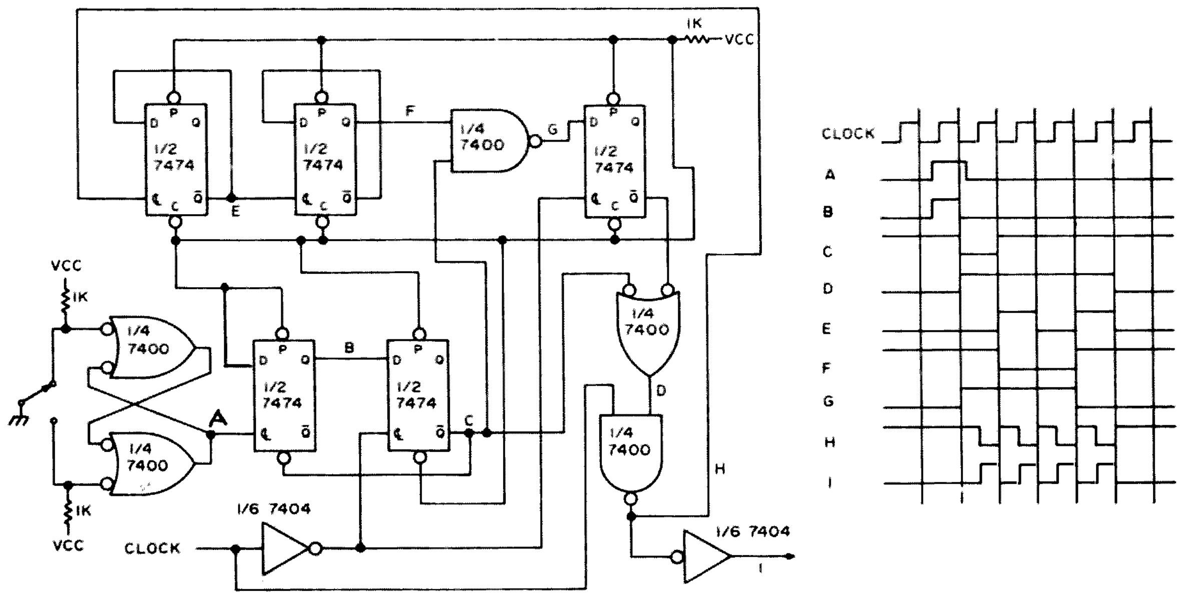


Fig. 11. A circuit that produces four clock pulses each time the push-button switch is pressed.

Draw a timing diagram if necessary and you should find out why your circuit starts off wrong.

Useful Circuits

Some helpful circuits that you might be able to use when testing your digital circuits are shown in Fig. 9, 10 and 11. As you know mechanical switches bounce for several milliseconds when closed. If you try to generate a single clock pulse from a switch closure you will really get many because of the contact bounce. Fig. 9, is a switch debouncer used frequently to generate a single pulse on a switch closure. The only requirement for it to work is that the wiper of the switch just bounces between a contact and an open. If it bounces against the opposite contact (which most don't) then the latch will alternate states and not produce the single output desired.

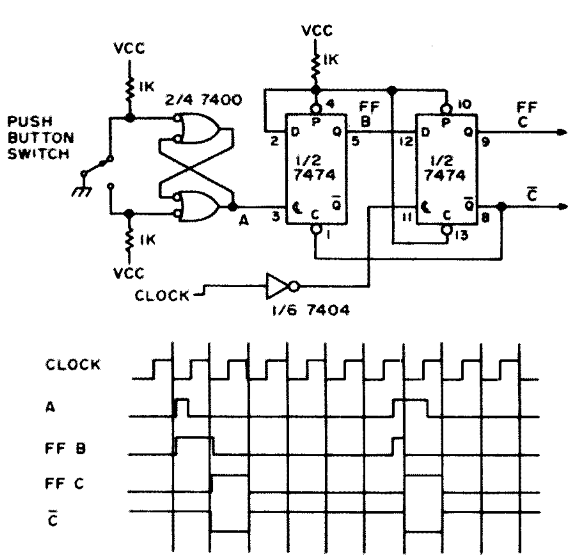


Fig. 10. A synchronizer that produces one output pulse one clock period wide, synchronized with the clock for each switch closure.

Fig. 10, is a circuit for a synchronizer. It produces a single pulse one clock period wide, synchronized to the clock on each switch closure. When the switch is closed the de-bouncing latch goes HIGH and clocks flip flob B HIGH. The next clcok pulse clocks flip flop C HIGH and resets flip flop B. The next clock takes flip flop C LOW and the circuit is ready to go again.

If you need a circuit that generates a burst of clock pulses each time you press a switch, for instance 4 clock pulses, then use the circuit in Fig. 11. Modifications can produce any number of clocks that you desire. If you haven't mastered the art of writing the next state equations for a digital circuit, or don't even know what they are, then draw out a timing diagram. That's the next best way to get going.

So let's get those pencils out, erase the race in those designs and go digital.

. . .W3HPX

Walt Pinner WB4MYL
7304 Lorenzo Lane
Louisville, KY 40228

ID TIMER

Operating convenience – plus – impressive to visitors.

For about eight dollars this project can be many things to many people. This ten minute station timer utilizes a digital readout display indicating elapsed time in minutes. When nine minutes have passed, the 9 numeral blinks for 60 seconds, which is a real eye catcher, before resetting to zero, starting another count cycle. A manual zero reset is provided to start the timer at the beginning of your QSO.

If you have not, as yet, got your feet wet with relaxation oscillators, ICs or numeric display tubes, this is a simple starter project.

Circuit

The timer is line operated, and all circuitry should be isolated from the exterior cabinet. Line voltage is divided to supply 10 volts to the bridge rectifier. This voltage is dropped and regulated to 5 volts for the unijunction pulse generator and ICs. Adjustment of the 1 meg pulse generator pot determines the time necessary to charge the 100 μF timing capacitor, which should be good quality. When this capacitor charges sufficiently to turn on the unijunction, the transistor fires, discharging the capacitor and generating a voltage pulse across its 47Ω resistor. These pulses are counted by the 7490 decade IC. The output of the counter is fed to the 7441 decoder driver which turns on the proper numeral in the readout tube.

The 9 numeral is connected as a relaxation oscillator and flashes. The flash rate may be varied by changing the value of the 100K resistor. The 3 μF capacitor must be paper, not electrolytic. Approximately 140 vdc for the readout is obtained from the line via a single diode and filter.

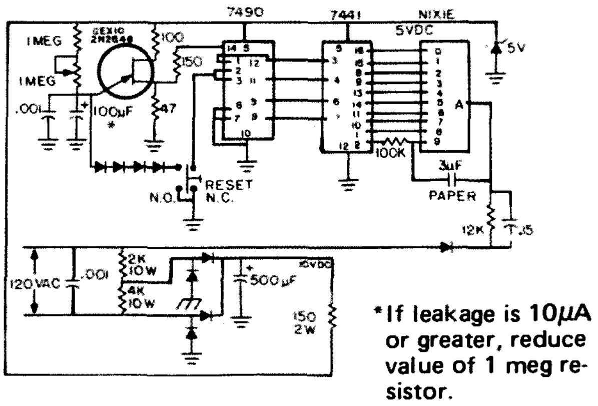
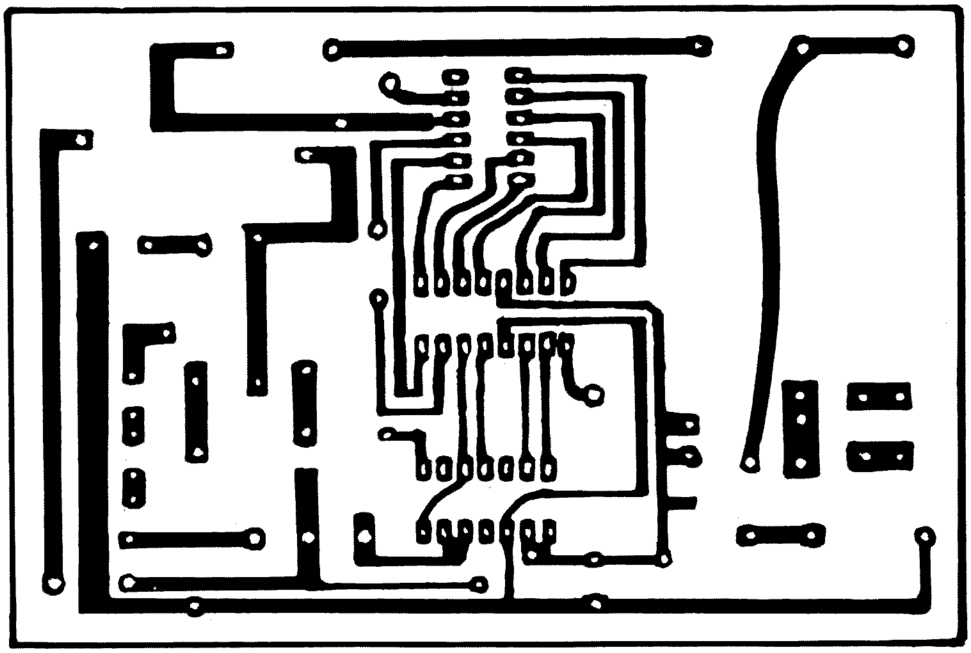


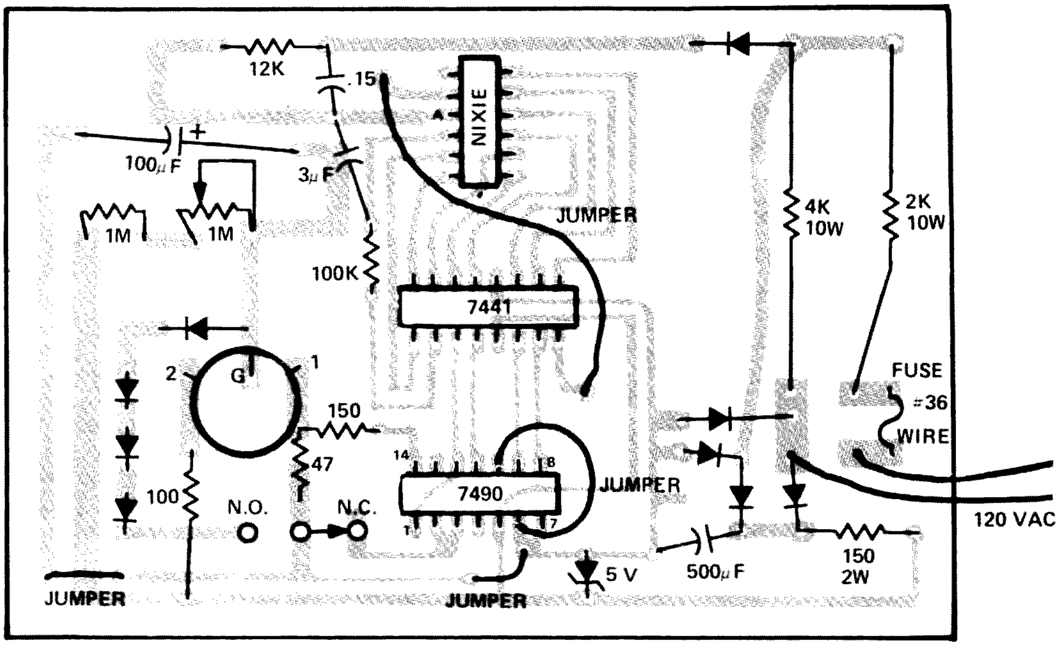
Fig. 1. Schematic. Diodes are 1N4001 or similar.

Parts List

ITEM	QUAN.
7490 IC	1
7441 IC	1
NIXIE B5750, NL 1220 or similar	
GE X10 or 2N2646	1
1N4001 diode	9
2K 10 w	1
4K 10 w	1
150Ω 2 w	1
12K 1/2 w	1
100K 1/2 w	1
150Ω 1/2 w	1
47Ω 1/2 w	1
100Ω 1/2 w	1
1 meg 1/2 w	1
1 meg pot	1
.001 μF	2
500 μF 10V	1
100 μF 10V	1
3 μF 200V	1 paper
.15 μF 200V	1
SPDT push button SW	
5V ZENER 1/2 w	1

If you choose not to use the printed circuit board, assembly may be on .2" vector board. Straighten every other IC pin and hand wire the connections using the circuit board as a guide.





Re-set

Depressing the manual reset button, lifts the 7490 terminal 2 and 3 from ground, re-setting the count to 0. At the same time, the 100 μF capacitor is shunted to ground through four diodes, which discharges it to about the same level as does the transistor. This eliminates an extra long first count after a manual reset.

If you have not done so before, the action of all functions of this circuit may be observed with a scope or VTVM.

This circuit, of course, may be used for other timing functions by changing the value of the unijunction timing components.

Accuracy on several units built was within 15 seconds over any ten minute period.

. . .WB4MYL

John T. Hunt
251 W. Bruceton Road
Pittsburgh PA 15236

FAIL SAFE SWITCHING IMPROVED

The article, Fail Safe Switching, *73* October, 1971 was useful and quite correct. There are some simplifications and improvements possible, however. The circuit of Fig. 2 in that article does exactly what it is purported to do and the logic switching scheme for it could be drawn as in Fig. 1.

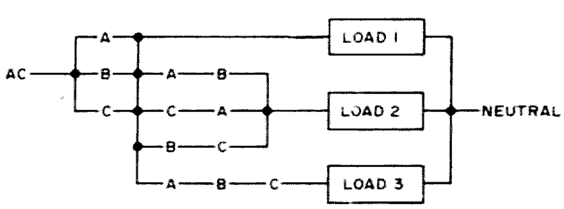


Fig. 1. Logic switching scheme.

In Fig. 1 each letter represents one pole of a given switch. Such a representation makes it easier to see what the circuit does than a conventional wiring diagram. In this

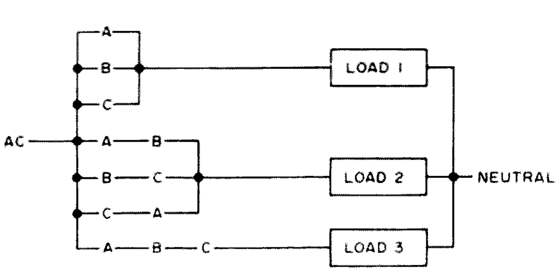


Fig. 2. Logic circuit.

case all three loads have to be carried by the first A, B and C contacts. The contact load can be reduced if the logic circuit (Fig. 2) is used.

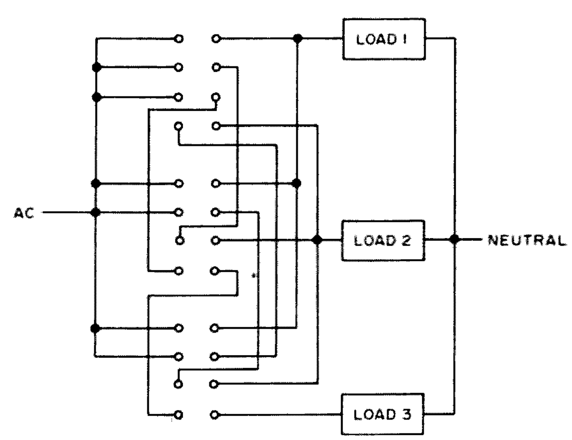


Fig. 3. Conventional wiring diagram.

The conventional wiring diagram could then look like Fig. 3. In reference to Fig. 3, if the momentary open can be tolerated, a simpler setup can be provided by using double throw switches. The open time is the

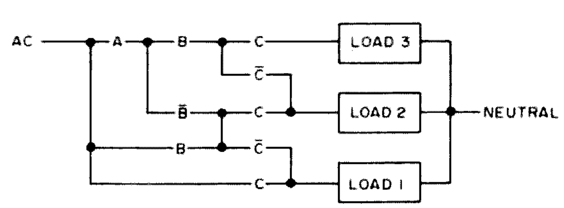


Fig. 4. Logic switching arrangement when C is first operated.

time it takes the switch between the normally open and normally closed positions. If make-before-break contacts are used no

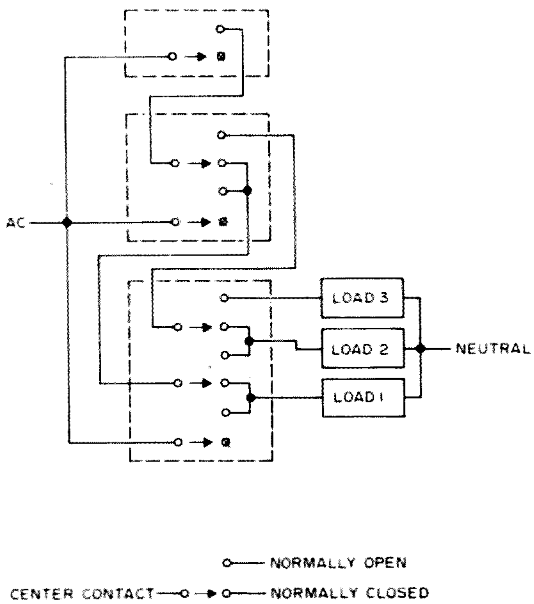


Fig. 5. Conventional wiring diagram with a double throw switch.

open time exists, but many applications can readily tolerate the short duration open. (Caution with the transfer contact types is needed, however. For example, if C is first operated all three loads are momentarily on during the switch motion.) The logic switching arrangement to achieve this is suggested by Fig. 4.

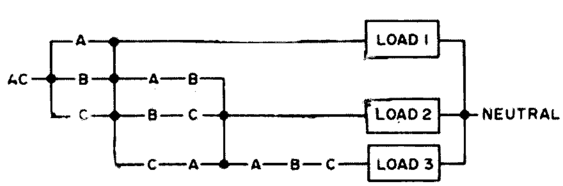


Fig. 6 Logic scheme for most foolproof scheme wiring diagram.

In Fig. 4, the plain letter C is a normally open contact and $\overline{C}$ is a normally closed contact, etc. One C and one $\overline{C}$ with a common connection form one pole of a multiple pole – double throw switch. The conventional wiring diagram would appear as Fig. 5. Notice that the switch requirements are only 1 SPST, 1 DPDT, and 1 3PDT, and that the contact loading is divided. All contact ratings should be equal to the heaviest load.

Hope these simplifications prove useful.

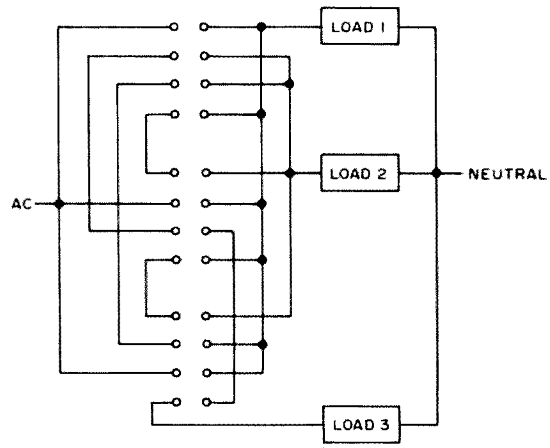


Fig. 7. Series arrangement of contacts and guards against contact failure.

If one wants the most foolproof scheme use the logic system of Fig. 6. Notice that load 2 cannot receive power unless load 1 is supplied power, and load 3 cannot receive power unless load 2 is supplied power. This is achieved by the series arrangement of contacts and guards against contact failure. The wiring diagram for this could be (since several are possible) as it is shown in Fig. 7

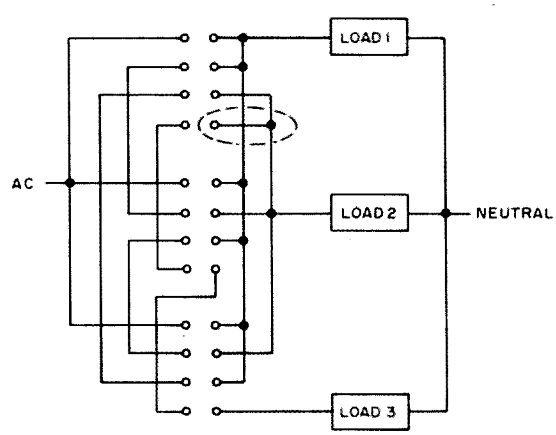


Fig. 8. Modification of wiring diagram in article.

Or the diagram in the article could be modified as shown in Fig. 8 (dotted area). The output of the fourth contact down is moved from the line feeding No. 1 load to the line feeding the No. 2 load.

. . .Hunt

CIRCUITS, CIRCUITS, CIRCUITS...

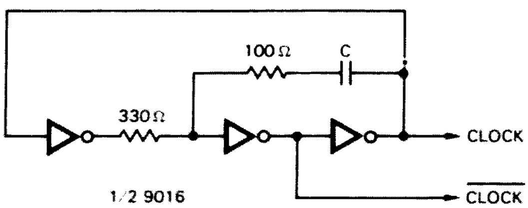
The following circuits have appeared in the referenced books, magazines, application notes, etc. While we try to reproduce all of the information that should be needed by an experienced constructor, readers may want to avail themselves of the original sources for peace of mind.

Readers are requested to pass along any interesting circuits that they discover in sources other than U.S. ham magazines. Circuits should be oriented toward amateur radio and experimentation rather than industrial or computer technology. Submit circuit with all parts values on it, a very brief explanation of the circuit and any additional parts information required, give the source and a note of permission to reprint from the copyright holder, if any, and the reward for a published circuit will be a choice of a 73 book. Send your circuits to 73 Circuits Page, 73 Magazine, Peterborough NH 03458.

All of the circuits used this month were sent in by Douglas R. Schmieskors, Jr. The 4A Voltage Regulator circuit is taken from the Fairchild Semiconductor *Voltage Regulator Applications Handbook.* All of the other circuits used this month are taken from the Fairchild Semiconductor *TTL Applications Handbook.*

If you have any circuits that you think might be of interest to others send them to 73.

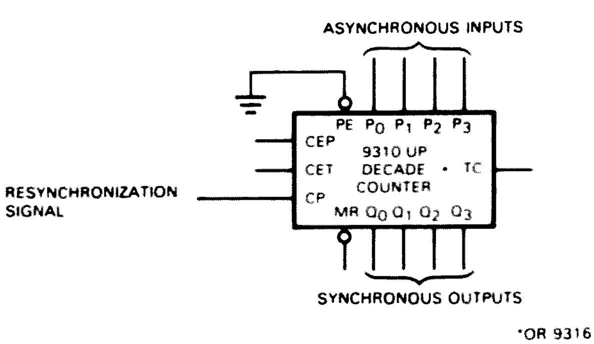
SIMPLE RC CLOCK GENERATOR



C	f
200 pF	5 MHz
1600 pF	1 MHz
0.018 µF	100 KHz
0.18 µF	10 KHz

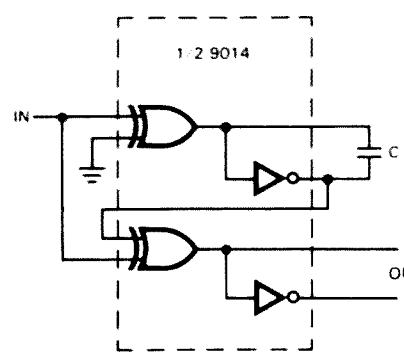
The simple TTL clock generator circuit shown provides a clock satisfactory for most simple TTL systems and it always starts oscillating without coaxing. This circuit requires only ½ of a hex inverter package and three passive components — two resistors and a capacitor.

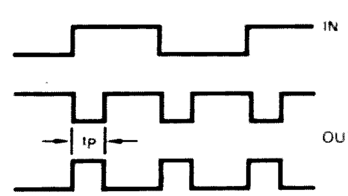
RESYNCHRONIZER



A resynchronizer using a 9310 (or 9316) as four D-input flip flops is shown. In this circuit the PE input is grounded, and the resynchronizing input is applied to the CP input. In most cases, the 9300 universal shift register is preferable for this function.

DUAL EDGE DETECTOR

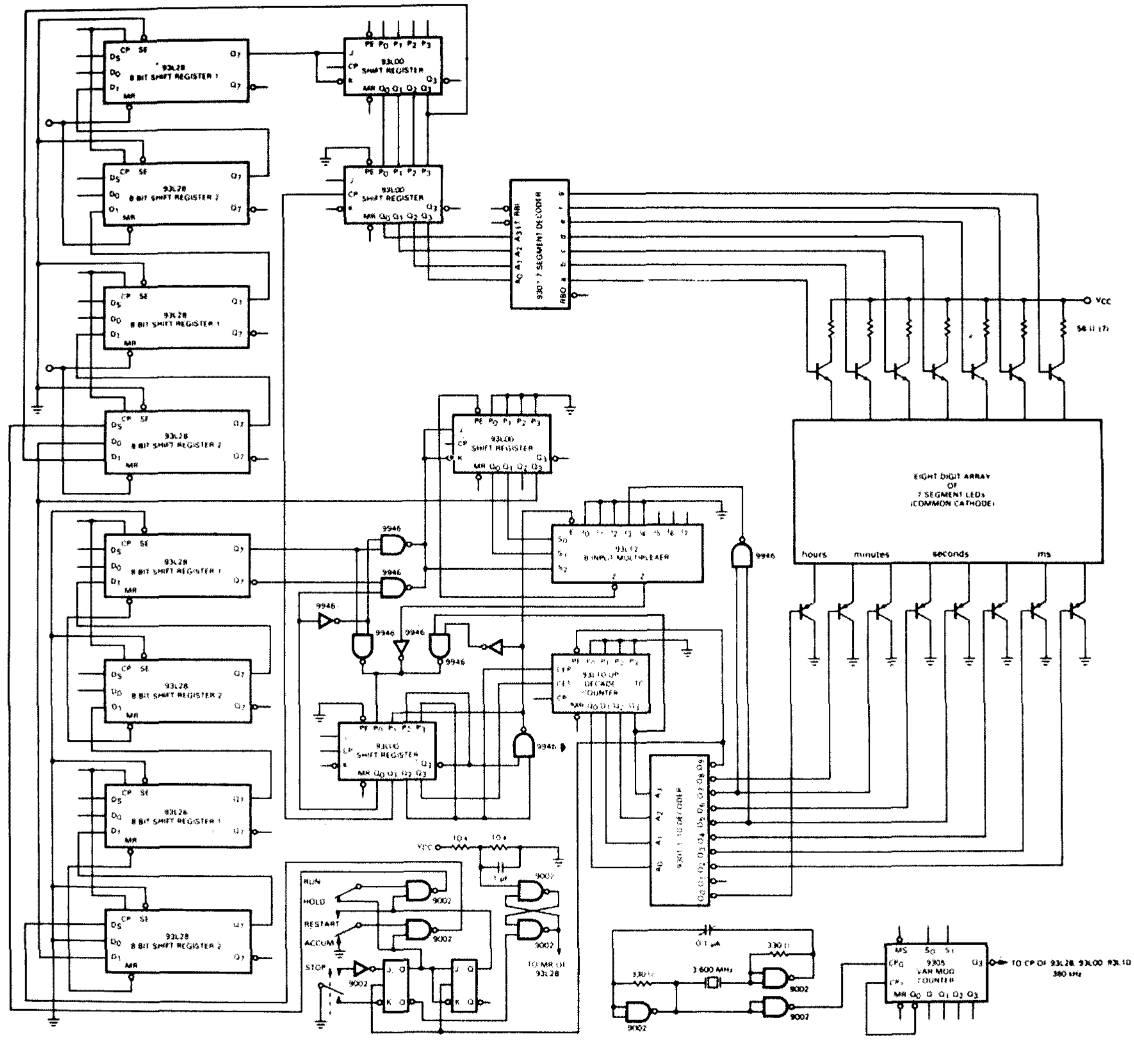




C	t_P
0	10 ns
200 pF	30 ns
1000 pF	70 ns

Half of a 9014 quad Exclusive-OR gate with one capacitor provides a circuit generating an output pulse for both a LOW-to-HIGH and a HIGH-to-LOW transition of the input signal. This function is useful for regenrating the clock in a self-clocking PDM transmission system. When fed with a square wave input, this circuit acts as a frequency doubler.

BATTERY OPERATED,CRYSTAL CONTROLLED STOPWATCH WITH MULTIPLEXED DISPLAY

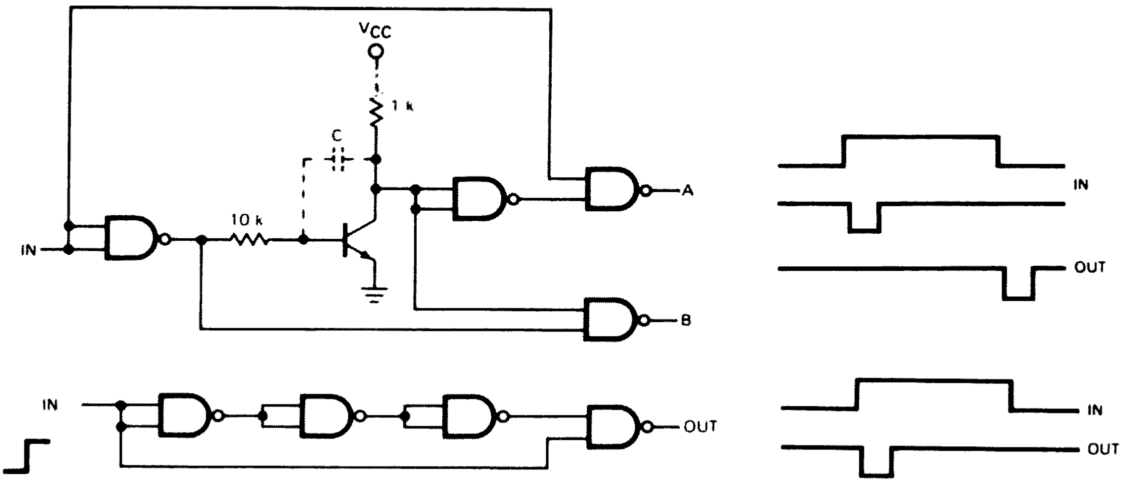


*All 9300, 9310, 9312 and 9328 devices in this circuit are Low Power version.

This circuit stores 9-digits bit-serially in a 36-bit shift register comprised of two 9328 dual 8-bit shift registers and a 9300 4-bit universal shift register incrementing or decrementing with an exclusive OR. This counter offers very economical display multiplexing and is shown driving 7-segment LED displays.

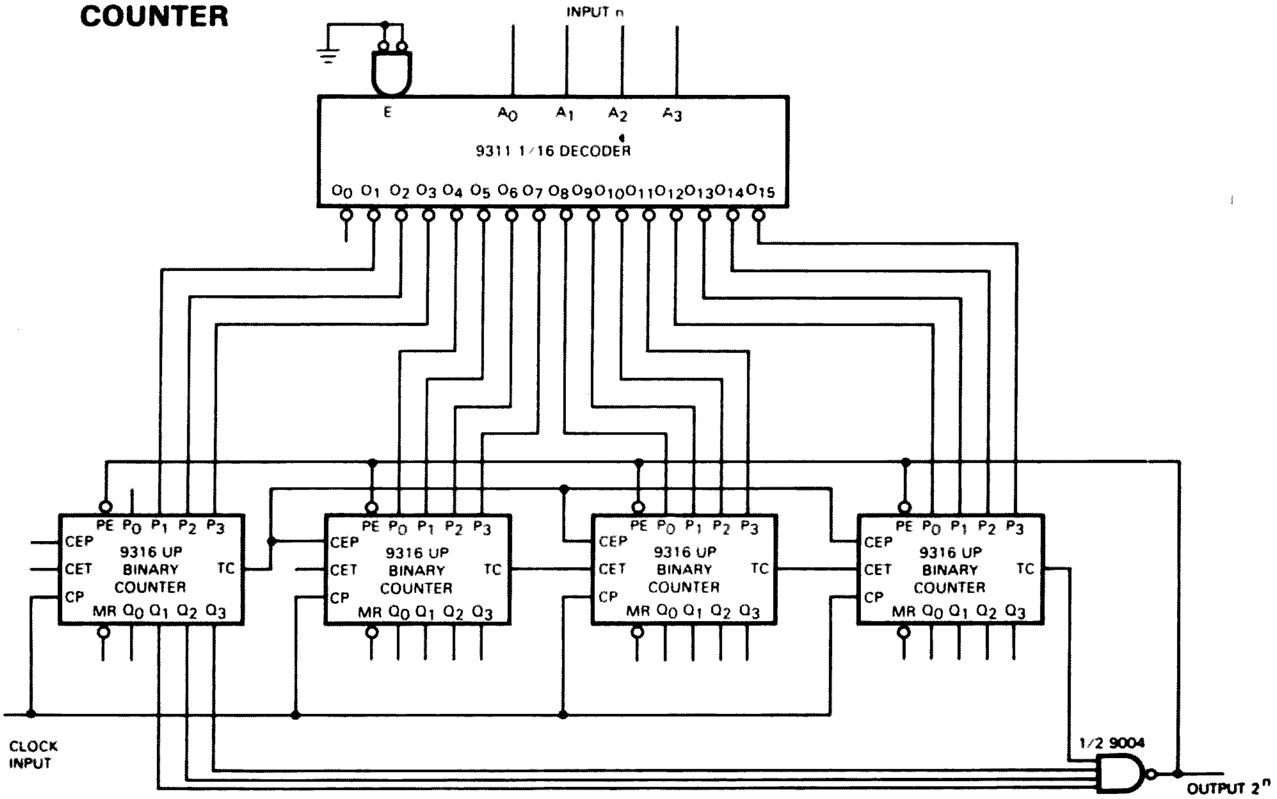
This circuit operates as a crystal-controlled stopwatch, displaying milliseconds to hours. The time counter is a 36-bit (9-digit) bit/serial incrementer (two 93L28s, one 93L00) controlled by a 3.6 MHz crystal oscillator and time base (9305, 93L00, 93L10 and 9301) so that the 10-second and 10-minute digits are counted modulo 6. A second set of shift registers stores display data independently of the state of the counter whenever the Stop contact is activated. The contents of the storage register are strobed every four clock pulses into a 93L00 feeding a 9307 7-segment decoder. This decoder, through current-limited buffers, drives the anodes of the 8-digit LED display matrix. The cathodes are sequenced by the 93L)1 and eight PNP transistors. Since this counter requires 36 clock pulses to increment the least significant digit (1/10ms, not displayed), the shift frequency is 360 kHz, derived from a 3.6 MHz oscillator through a 9305 decade counter. In this case, the low count rate inherent to serial incrementers is advantageous, resulting in a shorter divide chain for the time base. The use of low power MSI keeps total power consumption under 2.5W and also simplifies clock distribution.

EDGE DETECTOR

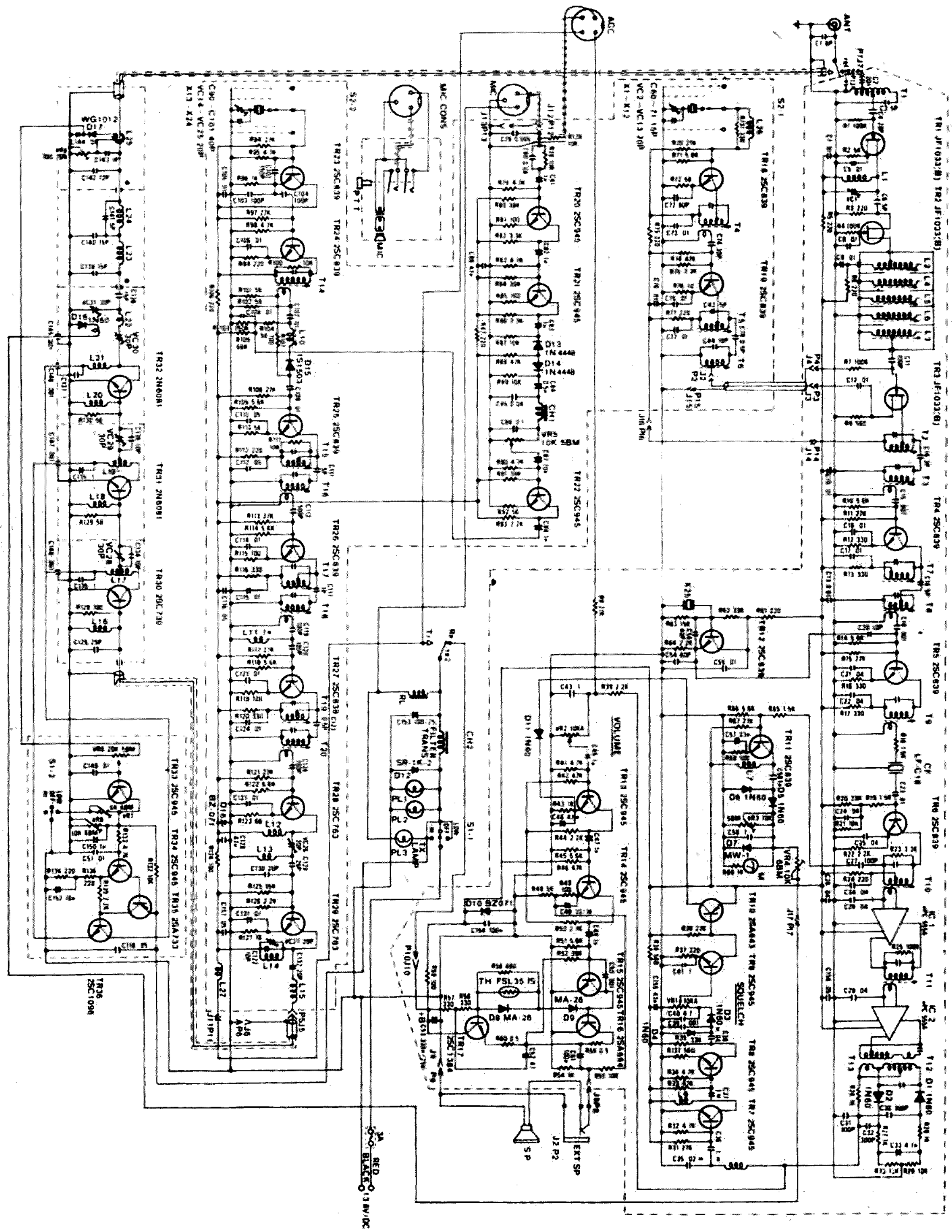


This edge detector circuit generates a negative-going pulse on output A for each LOW-to-HIGH transition of the input, and generates a negative-going pulse on output B for each HIGH-to-LOW transition of the input. The pulse width is adjustable by varying the Miller capacitance. A non-adjustable short pulse (≈20ns) on the LOW-to-HIGH transition of the input can be generated by replacing the transistor inverter stage with the unused fourth NAND gate.

COUNTER



A programmable counter can be designed using a 9311 decoder that counts in modulo 2^n, where n is the programmable input. Shown above is a 9311 decoder and four 9316 binary counters capable of counting up to 2^{15}. The input n drives the selected output LOW so that when a parllel load occurs, all HIGHS are written into the register except at the stage represented by the address n. The counter counts pulses and reaches the condition 000011111111111, at which point, the terminal count of the last stage goes HIGH. Ater 14 additional pulses bring the total 2^n-1, the three remaining inputs to the 9004 gate are HIGH, and the next clock pulse reloads the counter to its original condition. The circuit therefore performs as a 2^n programmable divider.



CIRCUIT DIAGRAM

Letters. Cont'd from page 16.
doms left and from our place in the concentration camp we will wish we had listened to Wayne and cut the monster down to size before it (the IRS I mean) cuts us.

It really is a monster. It is the only governmental organization that openly calls the taxpayers (who support it), "THE ENEMY." It works on the principle that the taxpayer is guilty until proven innocent. It has so many conflicting regulations that it doesn't know itself what is right and what is wrong.

I could go on and on with a catalog of horrors, but you have pretty well covered them. What I am trying to say is that the very principle is wrong. We must put a handle on this monster, and I am glad that you have the guts to stand up to them. The Internal Revenue Act was shoved through originally by the international money boys, so that they would be sure to have enough money to finance World War I. Soon as it was passed, they cooked up the war so as to enrigh themselves. Then it took on a life of its own and is now gorging itself on the taxpayer who has reached the breaking point. But the worst thing about the whole rotten set up is that the IRS is used as a *punishment* arm of the government. When they can't "get" someone through legal means, they sic the IRS on them. That is what I take it they are doing to you, and therein lies the injustice.

Name Withheld
Hong Kong

Some readers say they think IRS articles do not belong in a ham magazine, that if they want to read about that they can do it elsewhere. Since virtually all publishers are so scared of IRS they can't even think about it, one wonders what magazine readers will read to get this information. 73 is not afraid, so if you want more inside info on the IRS, realize that there is no other source. . .ed. Reprints of the IRS editorials are available for an SASE.

TELETYPE EQUIPMENT AVAILABLE

I have just had a large number of Teletype machines released to me by Western Union. These are mostly page printers: Model 19's, Model 15 KSR's and Model 15 KSR's in floor consoles. The machines have been in storage, and some of them are still in their original factory crates never having been put into service. Most of the remainder were given standard overhauls just prior to being placed in storage.

The Model 19's are complete with printer and keyboard, transmitter-distributor, perforator and character counter, and a heavy-duty steel desk. The heavy-duty power supplies are built into the desk.

The Model 15's are all KSR's (keyboard), and are in two styles. The first style is the standard cabinet, which is normally placed on a desk or table for operation. The second type is in a sound-proofed floor console, whose shape is somewhat similar in appearance to a Model 28 KSR.

All of these machines are equipped with WRU (who are you), and answer back (here is) mechanisms which can be coded with up to 18 characters for automatic station identification at the touch of a single key.

All machines have synchronous motors, low paper indicators, etc., and the cabinets, consoles, and desks are a pleasant light green color. All are in excellent condition.

In addition to the above, there are perforators and reperforators (both typing and non-typing; both with and without keyboards), plus strip printers (with keyboards) and transmitter-distributors, but no statement can be made as to the condition of these. (For example, the end-of-line indicators need repair on most of the perforators.) These all have synchronous motors, incidentally, which are interchangeable with Model 14, 15, 19, etc., gear.

Finally, there is a wide variety of miscellaneous test equipment, test tables, power supplies, polar relays, end-of-message readers, duplex repeaters, Siemens dial Telex gear, etc., plus a few parts for Models 14, 15, 19 and 32.

The equipment is to be released to any interested amateurs at cost, according to the following price schedule:

Quantity Available Item	
33 Model 15 KSR	$39.00 each
18 Model 15 KSR in floor console	46.00 each
17 Model 19 (ASR, complete)	79.00 each
18 Model 2-B strip printer with keyboard	5.00 each
16 Misc. perforators & reperforators, with and without keyboard	5.00 each
9 Transmitter-Distributors	4.00 each
Misc. test equipment, etc.	$1.00 to $4.00 each

Of course, as with most equipment distributions of this type, there is no guarantee, and you can't get your money back. But, with the exceptions noted previously, the condition of the equipment is very good to excellent, and is a genuine bargain.

Distribution will be on a first-come, first-serve basis. I cannot ship (with the exception of the few pieces that are already crated), so purchasers must make their own arrangements for pick-up.

For additional information, I can be contacted at the following address: Bill Johnston WB5CBC, 1808 Pomona Drive, Las Cruces NM 88001. All inquiries *must* be accompanied by a SASE.

COUNSEL FOR THE TAXPAYER

Last year, Internal Revenue Service officials assured Congress that they were making conscientious efforts to comply with the 1967 Freedom of Information Act. Have they kept these promises?

No – according to testimony received in April by the Senate Appropriations subcommittee on the Treasury, chaired by Joseph M. Montoya (D-NM), Philip and Susan Long, of Bellevue WA said IRS officials have left "a string of broken promises."

IRS disclosure staffers still flout the Freedom of Information Act. Their arrogance is almost unbelievable. When the Longs asked Freedom of Information Chief Mark Farbenblum why IRS personnel don't even follow their own regulations, he merely shrugged and said: "Oh, we don't pay any attention to that directive."

Members of Ralph Nader's Tax Reform Research Group have been similarly frustrated in their attempts to examine data compiled by IRS at public expense.

From an unrevealed source, Nader's group obtained a copy of IRS Document 5667 for fiscal 1972. It's a bunch of statistical tables, charts and graphs called "The Audit Story." IRS officials had tried desperately to keep this information under wraps.

The fat was in the fire. Nader got the telltale document published in the record of hearings held last year by the Montoya committee. When he introduced it, Nader said, "This is a collection of information which should be available to anybody who can buy a newspaper."

Despite the importance of this information to citizens who pick up the tab for compiling it, the Longs and the Tax Reform Research Group got the run-around when they tried to get a squint at 5667 for years other than 1972. Here are a few highlights:

April 19, 1973: IRS gave the Longs written authorization to inspect such pre-1972 issues of 5667 as "may" be on hand in the Seattle District Office. You guessed it, Pre-1972 issues in Seattle were as scarce as hen's teeth.

August 31, 1973: The Longs wrote to IRS requesting access to 5667 for fiscal '73, which had ended June 30, 1973. Would you believe it? IRS said Document 5667 for 1973 and subsequent fiscal years would not be published!

November 21, 1973: Robert M. Brandon, Tax Reform Research Group director, wrote to IRS requesting 5667 for fiscal 1973, or in lieu thereof, the source documents. IRS Assistant Commissioner John Hanlon, replying, merely said IRS did not plan to publish 5667 for 1973. He ignored

Brandon's request for the source documents, which IRS still is compiling.

December 21, 1973: Brandon wrote to Farbenblum, making crystal clear the specific source documents he wanted. To this day, he has received no reply.

February 28, 1974: The Longs visited the IRS "Freedom of Information" reading room in Washington. Surprise! No statistics there. The shelves were as bare as a college streaker.

Mrs. Lotus Savoy, the attendant, said she "recently" had been ordered to take all the statistics out. Where were they? She would say only "you'll have to talk to the disclosure staff about that." The Longs did. They got loads of double talk, but not one peek at Document 5667.

April 1974: These and other disturbing facts were made known to the Montoya committee, which hasn't yet approved IRS's appropriations for fiscal 1975, to begin July 1.

May 8, 1974: Commissioner of Internal Revenue Donald C. Alexander wrote to the Longs: "The Audit Story (5667) is available to the public, and issues for the years 1962 through 1972 are in the Freedom of Information Reading Room." By that time, the Longs were back home in Bellevue, some 3000 miles away from the reading room.

May 1974: Still no word on when, if ever, this vital information is to be made available to anyone for 1973 and subsequent fiscal years. But as they say, hope springs eternal in the human heart. Who knows? Some sunny day Brandon may get an answer to his letter of December 21, 1973.

Internal Revenue Service officials say taxpayers are satisfied with our federal tax system. Are they?

They certainly are not, according to a stream of worried citizens who testified in April before the Senate Appropriations subcommittee on the Treasury. These courageous Americans came to Washington from great distances, at their own expense, to tell chairman Joseph M.Montoya (D-NM) and his colleagues what's wrong with the tax collecting system.

One of the most impressive witnesses was H. M. "Hank" Greenspun, outspoken publisher of the crusading Las Vegas Sun, Nevada's largest morning newspaper. He warned, "Some future administration may be successful in focusing the awesome power of the IRS against its political enemies. And that will spell the end of democracy in this country."

Greenspun said that if he wanted to become dictator of the United States, he'd seek first to gain control of IRS. "Within months" after taking over this agency, he could become the absolute ruler of the U.S.A., he declared.

Fantastic? Not at all. Here are some of the techniques a would-be dictator could use, if he controlled IRS, to destroy his enemies and reward his friends:

* He could stymie his enemies by having revenue agents conduct time-consuming, infuriating audits of their records, searching out every error, no matter how picayune it might be.

* In addition, he could sic special agents on his enemies. These are gumshoeing detectives of the IRS Intelligence Division who try to get the goods on taxpayers suspected of criminal tax fraud. They're often called "the American gestapo."

* He could use the IRS jeopardy assessment power to tie up virtually all the assets of his enemies without a single court order, before they had been given a chance to test the validity of the assessments in court. This maneuver has reduced thousands of defiant taxpayers to putty, leaving them without a dime to spend for such essentials as living expenses, legal fees and business operating costs.

* If his "jeopardized" enemies couldn't post bond to secure the payment of enormous IRS-determined deficiencies, he could sell them out at sacrifice prices. Years later, the Tax Court might find that nothing was owed to Uncle Sam in the first place. But what the heck! The victims would be mortally wounded by that time anyway. They'd get back, not their property or its value, but only the money IRS had taken in from the forced sales, after deducting storage and other selling expenses. Not a nickel for lost time, lost profits or litigation expenses.

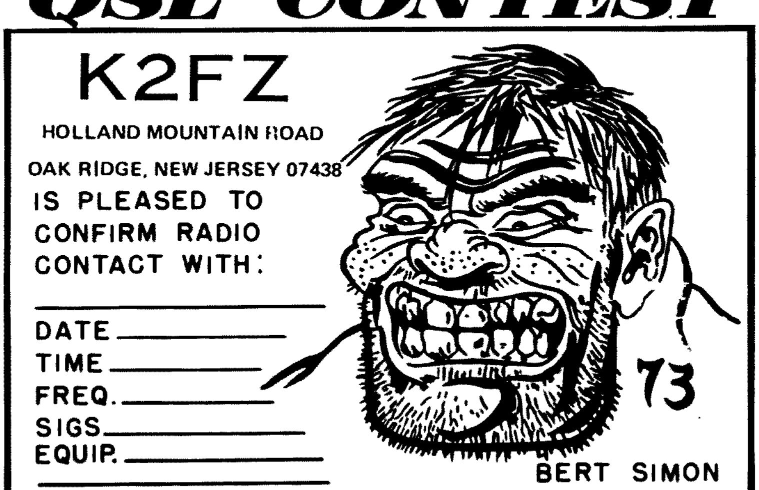
* In his bid for dictatorship, a person in control of IRS wouldn't be limited to destroying his enemies. With equal facility, he could turn about and win the support of influential people by rewarding them in various ways. For example, he could insure them against audits and investigations, so they could wheel and deal as they pleased. And he could assure them of favorable advance rulings from IRS, so they could carry out their plans without fear of adverse tax consequences in future years.

Smooth Treasury lobbyists have talked congress into building this juggernaut. Over the years, our elected legislators have bestowed more and more power on IRS to strengthen its whip hand and keep tax money pouring into Washington.

Taxpayers have just about had it. The winds of tax revolt blow stronger day by day.

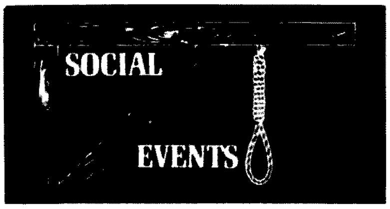
E. Edward Stephens
815 King Street
Alexandria VA 22314

QSL CONTEST



Our hulking QSL contest winner this month is Bert Simon K2FZ, of Oak Ridge NJ. The picture of Bert on the card was done after he had successfully worked DXCC in one weekend only to find that in his enthusiasm he hadn't written anything down.

You too can make it really big in life and win a 1-year subscription to 73. (There are some that say it's the next best thing to receiving the Congressional Medal of Honor). Send all winning entries to 73 Magazine, Peterborough NH 03458. SEnd all loosing entries to QST, Newington CT 06111.



UPPER PENINSULA HAMFEST

August 3 & 4, 1974, Negaunee Township Hall, Negaunee MI. Hiawatha Amateur Radio Association host. Registration $2. Swap n' Shop, Program for XYL's, Door prizes. Mobiles talk in on 3.920 and 146.94. Reservations and info: Frank K4CGQ/8, 322 Fortress, Sawyer AFB MI 49843. 906-346-5501.

ARK ARC

The Arkansas amateurs proudly announce the annual Queen Wilhelmina Hamfest at Queen Wilhelmina State Park on Rich Mountain, Mena AR, Saturday and Sunday, September 7-8, 1974.

WARREN 17TH

The 17th Annual Warren Amateur Radio Association Hamfest will be held at the Yankee Lake Amusement Park in Yankee Lake OH, on Sunday, August 18, from 9:00AM-6:00PM EDST. For more information contact: R. Drew Kelley W8GFG, 822 Moore Street, Hubbard OH 44425. Phone: 216-534-3376. Bus. Ph. 216-448-6801, Ext. 393.

HAMILTON – HAMILTON

Q.T.H. – Holiday Inn, Hamilton, Ontario, Canada. Dates – October 25, 26, 27, 1974. There will be eight forums, extensive ladies program, fleamarket, banquet. Everything under one roof. For registration forms write: P.O. Box 836, Burlington, Ontario, Canada.

STRICTLY CINCY

This year the 37th Annual Cincinnati Hamfest will again be sponsored by the Greater Cincinnati Amateur Radio Association and will be held on Sunday, September 15, 1974, at the new Stricker's Grove located on State Route 128, two miles west of Ross (Venice), Ohio, north of Cincinnati. For more information contact: Greater Cincinnati Radio Association, 3965 Harmar Ct., Cincinnati OH.

MONTREAL '74

The 1974 Montreal Hamfest will be held August 4, at the MacDonald College Farm, Ste Anne de Bellevue. Prizes, Giant fleamarket, technical sessions, family fun, $2.50/adult. For more information contact: VE2RM, Box 201, Pointe Claire-Dorval, Quebec H9R 4N9.

OH! ADRIAN

The Adrian Amateur Radio Club will hold a Hamfest on October 13, 8:00AM – 3:00PM at the Lenawee County Fairgrounds in Adrian MI. Tickets $1 in advance, $1.50 at gate. Flea market, trunk sales, large display area – table $3 – half $1.50. Ample parking. prize drawing every hour. Grand prize drawing 3:00PM. Talk-in 146.46-.52-.94MHz For more information contact: Adrian Amateur Radio Club, Box 26, Adrian MI 49221.

ANGOLA FEST

The original FM hamfest Sunday August 4, 1974, near Angola, Indiana. Free flea market, entertainment for ladies and kids. Picnic grounds, campsites, boating, food, soft drinks, available, rain or shine. For information contact: Fort Wayne Repeater Assoc., Box 6022, Fort Wayne IN 46806.

20TH VHF

The 20th Annual VHF Conference will be held at Western Michigan University, Kalamazoo MI, on October 19, 1974. There will be Swap 'n Shop, Technical Forums, Evening Dinner, etc. For details please write: VHF Conference, S.M.A.R.S., P.O. Box 934, Battle Creek MI 49016.

GRAND EVENT

The Grand Rapids Swap and Shop will be held Saturday, September 21, 1974 at the Hudsonville Fairgrounds, M-21 at 40th Street, three blocks west of the Hudsonville traffic light. Admission is $1.75 at the gate, no charge for tables or trunk sales. Talk-in on .16/76 and 146.94. For more information contact: Grand Rapids Amateur Radio Association, Inc., P.O. Box 1333, Grand Rapids MI 49501.

LOUISVILLE BASH!

The 4th Annual Greater Louisville Hamfest will be held at the Oldham County Fairgrounds, LaGrange KY, on Sunday, August 25, 1974, from 8:00 AM until 6:00 PM. For more information contact: Denny Schnurr K4GOU, 1022 Sylvia St., Louisville KY 40217 or telephone 502-634-0619 (home); or 502-774-7549 (work) leave message.

THE L'ANSE CREUSE ARC

The L'anse Creuse Arc will open the fall season for swap 'n shops in the Detroit area on September 22, 1974, EDT 9:00 – 3:00 at L'Anse Creuse Central Jr. High School, main drawing 3:00, 3800 Reimold Rd., Mt. Clemens MI. Free parking, good food, prizes, tables $1.00. Admission $1.00. Talk-in on .94; For more information contact: L'anse Creuse Arc, 38024 N. Bonkay Dr., Mt. Clemens MI 48043.

BAY AREA FUN

The 11th annual greater Bay Area Hamfest will be held at the Royal Coach Inn in San Mateo CA on October 26 and 27, 1974. This year's event will be a joint effort with the ARRL Pacific Division Convention and is expected to break all northern California attendance records. Additionally, this hamfest is expected to provide an outstanding selection of technical seminars and amateur radio attractions. Attendance during the activities is expected to be in the thousands, with a good probability of 1000 people at the Sunday banquet, when a nationally known member of the amateur fraternity will be the principal speaker. For more information contact: Dick Altman WA6AXV, 1053 Shrader Street, San Francisco CA 94117.

FT. WAYNE ORIGINAL

The original FM Hamfest sponsored by the Ft. Wayne Repeater Association WA9EAU, will be held Sunday, August 4, 1974 at the Steuben County 4H Fairgrounds off the Lake James Crooked Lake interchange of I-69 3 miles of Ind. Tool Rd. 80-90. Gate and flea market, open 0600-1600, free coffee & donuts 0600-0800. Admission $2.00 includes main prize drawing. Children under 12 – free. Talk in – 16/76–94/94.

NINTH SWAPFEST

The ninth annual Northwest Texas Emergency Net Picnic & Swapfest will be held at the City Park in Levelland, Texas on Sunday, August 11, 1974. Bring your own picnic basket. Free registration begins at 0900. Lunch at 1300. Swapping all day. This event is for the entire family. Mobile talk in frequency is the net frequency 3950kHz and 28/88, 34/94 on 2m.

MELBOURNE HERE I COME

The 9th annual Melbourne Hamfest is September 7-8. All air conditioned, $1.50 at door. Tables $2/day. PCARS, P.O. Box 1004, Melbourne FL 32901.

OKLAHOMA HAM HOLIDAY

The Oklahoma Ham Holiday will be held Saturday and Sunday, August 3 and 4 in Oklahoma City. In addition to the largest fleamarket in the Southwest the program will include special speakers, technical seminars, equipment displays, MARS meetings and unique activities for the XYL. Overnight parking for recreational vehicles is available. For more information and advance registration write Central Oklahoma Radio Amateurs, Inc., P.O. Box 15013, Oklahoma City OK 73115.

CENTRAL OHIO AUC

The Central Ohio Radio Club, Inc., will hold their Annual Hamfest Sunday, August 11, from 8AM-6PM, at the Franklin County Fairgrounds, Hillard OH (just west of Columbus). Exit from 270 west at the Hillard Exit (N.W. of Columbus), follow the signs to the Fairgrounds. Come rain or shine – indoor display area. PRIZES – PRIZES – PRIZES. Flea market $3 – you furnish your table, only $2 – outdoor and you furnish your table, $1. Free auction too. Tickets $1 per person. Refreshments available. For more information contact CORCInc, P.O. Box 23, Delaware OH 43015.

RADIO EXPO

Radio Expo 74 will be held September 14 and 15, at the Lake County IL Fairgrounds, Rt. 120 and 45. Expo will feature manufacturers and club exhibits, seminars, door prizes and a giant indoor flea market. The gates open at 6AM, and the exhibit hall at 9AM. Free camping available. Reserved rooms are available at the Mundelein IL Holiday Inn, but should be reserved two weeks before Expo. Refreshments and meals are available at Expo Fairgrounds, and an Expo Cocktail Party will be held Saturday evening at the Holiday Inn. Talk in 16/76, 34/94, 52.525 and 443.75. Tickets $2, $1.50 advance sales. Sponsored by the Chicago FM club, WA9ORC/WR9ABY, PO Box 1014, Arlington Heights IL 60006.

FINDLAY EVENT

The Findlay Ohio Amateur Radio Club's annual hamfest will be held September 8, at Findlay Riverside Park. Talkin .94 and .52. Clubs wishing tickets write Clark Foltz W8UN, 122 W. Hobart, Findlay OH 45840. Please include number of tickets desired.

PEORIA – YAY!

The Peoria Area Amateur Radio Club's 17th Annual Hamfest will be held Sunday, September 15, at the Exposition Gardens, same place as last year. The site is located on Northmoor Road just west of University Ave., at the Northwest edge of Peoria. Lunch will be available and there are activities for the entire family. Free swap session, parking, contests, cartoons for the children and many prizes. Advance registration $1.50, $2 at the door. Banquet on Saturday, September 14 at V. Junction, $6 per person. For banquet reservations write Larry Pearsall W9FDY, 2224 W. Herold Ave., Peoria IL 61604. For hamfest information and advance tickets write Earl R. Kimzey WA9SCA, RFD 1, Hanna City IL 61536.

SO. JERSEY

The 26th Annual South Jersey Radio Association Hamfest will take place on Sunday, September 8, starting at 10AM, rain or shine, at Molia Farms Picnic Grounds, Malaga NJ (intersection of Routes 42 and 47). The day's activities will include swap shops (tail gate and tabletop), electronic equipment displays, prizes, ladies' games, and grab bags for the children. Family picnic tables are available for lunch baskets and barbeques. In addition, hamburgers, hot dogs, corn and soft drinks may be purchased at the picnic site. Free parking. Talkin on 145.20 and 3.930 MHz. Advance registration $2, $3 at the gate. For information and advance registration write to Bill Brandberg W2BBN, 322 Lakeview Ave., Haddonfield NJ 08033.

HAMARAMA

The Mount Airy VHF Radio Club's annual Pack Rat HAMARAMA is Sunday, October 6, at the Bucks County Drive-In Theatre located on Rt. 611 in Warrington PA. This is near exit 27 of the Pennsylvania Turnpike and north of Willow Grove PA. Huge flea market, auction, homebrew van, ATV demonstration, free playground for children, parking for 400 cars. Festivities begin at 9:30AM and auction starts at 2PM – RAIN or SHINE. Food concession on the premises with nearby motels and restaurants. Registration $1, tail gate selling only S2. Talkin .52, 52.525 and the club repeater (WR3ACD) 222.98/224.58. For further information and flier with map send SASE to Lee A. Cohen K3MXM 8242 Brookside Road, Elkins Park PA 19117.

OH SHENANDOAH. . .

The Shenandoah Amateur Radio Club will present its 24th Annual Hamfest in Winchester VA on Saturday and Sunday, August 3-4, in the Winchester Armory. It attracts one of the largest crowds of any hamfest in the eastern seaboard area. For further information write to the Shenandoah Valley Amateur Radio Club, Inc., P.O. Box 139, Winchester VA 22601.

LOUISVILLE KRC

The Fourth Annual Greater Louisville Hamfest will be held on Sunday, August 25, 1974, at the Oldham County Fairgrounds in LaGrange KY (4 miles north on I-71 on state route 146, signs posted). Admission is $1.50. Large flea market and ladies program, food available, children's prizes. Talkin 34/94 and 28/88. For more information contact Dennis W. Schnurr K4GOU, 1022 Sylvia St., Louisville KY 40217.

HAMBURG INTERNATIONAL

The Hamburg International Hamfest will be held in Hamburg NY (only 45-minutes from Niagra Falls), September 21, 1974, at the Erie County Fairgrounds. Fleamarket – Forums – Code Contest – Displays – Prizes (over $3000 in awards presented at the 1973 Hamfest) – plenty to eat and drink. Admission $2 in advance, $2.50 at the gate, $1 for fleamarket parking. Recreational vehicle parking, $2.50 for the entire weekend. Children under 12 admitted free. Talkin 31/91 (WR2ABU), .94, 7.255 (ECARS) and 3.925. Other area repeaters: 6.40/7.00 (WR2ACA) and 13/73 (WR2ADR). For further information contact Lin Brownell, 210 Bufalo St., Hamburg NY 14075. Phone: 716-649-3106.

VT FUN

The Burlington Amateur Radio Club, Inc., Burlington VT, will sponsor the 1974 International Field Day at the Old Lantern, Charlotte VT, Sunday, August 11. New events this year will include flea markets for both XYL's and OM's. Contests, demonstrations, and other activities for all members of the family. Portable color television raffle, and many prizes including main door prize of Heath 30MHz frequency counter. Refreshments available and camping on the grounds for trailers, campers, tents, etc. Come a few days early, no reservations necessary – talk in on 2m (34/94, 22/82, 16/76, 28/88). Special happy hour Saturday evening to celebrate 10th year of W1KOO repeater, and you're invited. Registration is $3.50 at the gate, $3.00 for early birds. Write to Slim Borkman K1RMI, 48-21, Richmond VT 05477.

FOXY LEAGUE

The Fox River Radio League will hold its Annual Hamfest September 22, at the beautiful Phillips Park in Aurora IL. Picnicking Zoo and Gardens for the entire family. Talkin on .94 and .52. Mail $1 advance donation with SASE to WB9HYH, President, 1888D Carnation Ct., Aurora IL 60506. Drawing #1, HR-2B, #2, ACT-R10H/L/U, and many others. Will ship U.P.S.

CENTRAL MINNESOTA

The Central Minnesota Hamfest will be held on the third Sunday of August (August 18), in Sauk Rapids Municipal Park (near St. Cloud MN). There will be refreshments, games, prizes, transmitter hunt and a swap market. This is the largest hamfest in Minnesota. The entry fee is $1 and the park is free for campers. For further information contact Lolly Loomis WNØGSD, Rt. 2, Rice MN 56367. Phone: 612-253-6408.

TACOMA FAIR

The Radio Club of Tacoma, Inc., presents their "Hamfair – '74" (much more than just a HAMFEST), Saturday and Sunday, August 17-18, at the Pierce County Fairgrounds (11 miles south of Puyallup, on Meridian Ave., Highway 161), Graham WA. Many door prizes – Grand Prize IC-230. FORUMS – CONTESTS – HIDDEN TRANSMITTER HUNTS – DISPLAYS – FLEA MARKET – FREE CAMPING – MORE. Registration for Saturday evening dinner and all activities $7. Children under 10 -- dinner only $2. Registration without dinner $4. For more information contact Bill Morgan W7GPR, 3421 E. 138th St., Tacoma WA 98446. Phone 531-3821.

S.W. MO

The Southwest Missouri Amateur Radio Club will hold its Annual Hamfest, swap meet and family picnic on August 25, 1974, at Lake Springfield Park MO. For further information contact Gary L. Polodna WBØIJZ, Secretary, Southwest MO Amateur Radio Club, 3121 South Parkview Drive, Springfield MO 65804.

HI SIERRA

The Sierra Nevada Hamfest will be held at Idlewilde Park, Rena NV, Saturday, August 10, 1974. Preregistration $10, after August 1, $11. Western style barbeque dinner, and a lot of prizes to be given away. Free beer and soft drinks. For information, contact Nevada Amateur Radio Association, P.O. Box 2534, Reno NV 89502.

ZERO-BEATERS A.R.C. HAMFEST

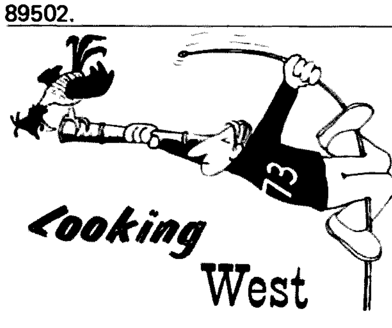
August 4, 1974, Washington MO City Park. It starts at 10AM CDST, Auction at 11AM. Attendance prizes and other goodies. Auction, free bingo for XYL, cake walk, candy scramble – gigantic traders row. For Hamfest information and tickets write or contact Zero-Beaters ARC, Box 24, Dutzow MO 63342.

GRANT COUNTY ARC

Indiana's fastest growing fall hamfest. Grant County ARC's annual hamfest will be held September 29, 1974, at the 4-H Fairgrounds. Admission still $1 for advance tickets, $1.50 at the gate. Large flea market, technical sessions, bingo for XYLs. Large inside pavillion, plenty of parking. Talkin on 19/79 and .94. For more information on advance tickets write to W9EBN, P.O. Box 815, Marion IN 46952.

75m PICNIC

The Iowa 75m Net will hold its annual picnic on Sunday, August 25, at Riverview Park in Marshalltown IA. All radio amateurs and net members are cordially invited to attend. You may check in at any time. A pot luck dinner will be served at noon. Everyone is asked to bring a covered dish. Drink and pop will be furnished free. Prizes will be awarded. For further information contact Jerry Smith WØDUN, P.O. Box 14, Akron IA 51001.



Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA 91402

If you live in California or any other mountain area, then you probably know about remotes, what they are and what they can do. If there is one facet of amateur FM that started and matured out here it is the remotely controlled amateur radio station, better known as the remote base. In order to answer a steadily growing number of letters from readers unfamiliar with remotes and the reason people build them, "LW" spent a day with the members of the Grand Funk Radio Network, owners of the WA6ZYY remote here in Los Angeles. While this is their story, I suspect it is indicative of many other systems. Here is Part 1 of "The Remote Base, Another Alternative."

Skip Hansen WB6YMH, Marc Abrams WA6DPB, and Gary Belda WA6ENS, were busy in Marc's workroom putting the finishing touches on the new ZYY machine prior to its installation in Hollywood Hills. They are three of ten hams that comprise the Grand Funk Radio Network. They are amateurs like the rest of us; looking for a better, more efficient way to communicate. The pride they took in what they had created was evident especially in Marc's voice as he demonstrated what the machine could do. "It can even turn on an electric heater at the site if we have to service it during bad weather," was Marc's comment as he hit a couple of numbers on his HT220's touchtone pad. The desk lamp lit up to simulate the aformentioned heater.

"Fine," I said. "One HT on 450 and you have access to 6, 2 and the phone line to boot. But why a remote instead of a repeater?"

"If you own a repeater," said Skip, "you are not really free to experiment with it in a way you might like. This is due to your obligation to your users to see that the repeater is there when they want or need it. But a remote is your own private toy. If you do something wrong and the system becomes inoperative, you have only yourself to blame or better yet, hold responsible. If you feel that you have spent enough time up on the hill, and you don't mind if the system is down for a few weeks, it's your decision. You aren't obligated to perahps hundreds of users. After all, what is our remote? It's like having our base station, mobile or HT always sitting at an excellent location."

According to the information I have been able to gather, there are well over 200 private systems in California – all operating between 439 and 450MHz. This figure includes small private repeaters, autopatch systems and probably 50 or so systems similar to ZYY. In the Los Angeles area we account for approximately 75 of the total state number. As Marc says, "You need only carry a small handheld unit equiped with a touchtone pad. With it you can operate our system as a straight 450 repeater, tune in any preselected 2m or 6m channel or access the phone line. It is the type of versatility that is impossible to offer on a repeater in an area with as dense an amateur population as you find here in L.A."

"Remotes, they're an outgrowth of the terrain we live with in this part of the country," Marc continues. "Go east to the midwest or south where the land is basically flat and in most cases you will find a tall building acting as a repeater site. The coverage of most machines in that type of installation averages 75 or so miles. Let's put this machine on 22/82 in our example. Well, if there is another machine on the same channel pair a hundred miles away, there will be little if any interference between the two systems. Now we put the same system on a 5000' mountain like Johnstone Peak. Even with the reduced power output required by the regulations, this system will cover over 200 miles. That makes this channel pair useful to only a few hams at a time. Fine, if you are willing to wait up to two hours to use a crowded repeater to get a few words in that may be of no real importance. But there are those of us that don't want to wait. A system like ZYY at the same type of location is there, ready and waiting to do its job at our command. I want to call someone on 2, I dial up 2m on the remote, select a channel and call him. Same for 6m, 450 or the autopatch. Most of the time it just listens on our 450 input,

but it also offers the versatility you can't get on a repeater. The potential is endless. Put up a beam and you can direct it from your HT. Name it and it can be done."

Well then, why are all remotes closed systems with confidential input and control channels? Skip answers, "I equate our remote with anyone else's personal amateur station. If you had spend $5000 on setting up the best lowband DX station you might not take too kindly to a total stranger walking into your shack, plopping down in your chair and firing up your station. All this without ever asking permission. We look at ZYY the same way. We put out the money, time and labor to build it. Over a $1000 and we have lost count of the manhours. We have the ability to converse with amateurs on 2m or 6m thru its ability to operate those bands, but it is our amateur station built for our personal use."

Skip continued, "The reason for not publicizing control channels is obvious and the way 450 is set up out here there is little likelihood of ever finding simplex operation on an input or output. If this should happen, that person would still need the proper tone to access the system. This information is also unpublished. Remember, while we have a set of 450 channels assigned to us, in reality the band is open for any licensed amateur to use. All bands are. The main difference is that we can hold a QSO for as long a time as we desire without a dozen breakers asking for signal reports or all of a sudden finding another QSO taking our place before we have reliquished use of the machine. On a private system these things just don't happen. The same holds true when we function up another band. Our location gives us the ears to hear a great distance and the voice to hold a simplex QSO that might otherwise be impossible. The remote lets us run simplex to areas that we might otherwise have to tie up a repeater to access. That seems like an efficient way to use the amateur spectrum."

Have not remotes been the cause of friction between amateurs on certain occasions? The answer is a qualified yes with a rather valid reason for this happening. *I will go into this and other aspects of remotes next month.*

WA2HVK/6

W2NSD cont'd from page 3.

how many people use the 73 oven, it is remarkable that it has been so trouble-free.

Frozen loaves of bread thaw in about two minutes (30 seconds a side). Ice cream can be made servable in a few seconds. Just about all leftovers come alive in the oven, except maybe salads. Leftover salad?

WILSON LOWERS HT PRICE

Can one of the better selling HT's become the best selling? Time will tell. Jim Wilson announced that his company is pulling out all stops to be first in HT's with their six channel two watt hand unit. The new price is $199, down from their $239, and still available through authorized dealers. This is about the only HT on the market with all crystals changable (most have one or two pairs soldered in) – the only one with the mike separated from the speaker for better fidelity (and so you can talk without having to move the HT from ear to mouth) – uses inexpensive AA batteries – has remote speaker/mike for belt operation.

ZAPPED FROM SPACE

A note from W5LVA enclosed a clipping about NASA getting ready to test a satellite solar power station (SSPS) in 1978. This will collect energy from the sun and beam it down via microwaves – about 5 kW worth.

The idea is that collecting solar energy here on earth is too lossy – much of it is dissipated in the atmosphere before it reaches the ground – and clouds turn off the power entirely, as does nightfall. This means a tremendous storage facility of some kind is needed. A satellite would get solar energy 24 hours a day and energies on the order of 10,000 megawatts are being considered.

That sounds like a great idea, but there are some glitches. Consider for a moment the household microwave oven which produces only a couple hundred watts of rf – and remember the frantic ado over the leakage from these units. The Environmental Protection Agency has worried about the leakage of a few milliwatts. So what happens if the multimegawatt beam from the satellite touches any of us? We'd get fried, wouldn't we? If we do build one – would we want the Russians to have one too? Or the Chinese? Or the Syrians? Ten gigawatts on a tight microwave beam should be able to do quite a job – how'd you like to try dodging that? It sounds like the death ray of Buck Rodgers.

MAKING HAMFESTS SUCCESSFUL

The key to the success of any hamfest lies primarily with the chairman. If you have a good chairman -- one with some know-how – with guts – and the ability to manage – you'll have a good hamfest.

Some clubs look around for a chairman for their hamfest and select someone with no business experience – someone who has been working for a large company and thus has never run into the problems that a fellow who has started his own business has encountered. Success eludes them.

The good hamfest chairman is an entrepreneur. He has his own business which he probably started himself. He has a few employees. He has had enough experience so he can delegate responsibility and then follow up on it to make sure it is exercised. He selects the exhibits chairman, tells him how to go about his job, and follows up on him every few days. He picks a program chairman, a ticket chairman, a promotion chairman, a program book chairman, a prize chairman, etc.

The entrepreneur is used to thinking in terms on the order of a hamfest

Cont'd on page 114.

A recent Sunday afternoon dinner at 73 Magazine with (left to right) Lin Green – Sage Green – Yvette Grimes WA8ULU/1 – Chuck Martin WA1HPS – Tony WA1MWN – and Sandy W1PVF. Chuck has done much of the 450 repeater work in the Boston area, including the WR1AAB machine near Peterborough on 449.1. He and Sandy spend most weekends, summer and winter, climbing the mountains of New Hampshire, often with 2m gear packed along. Tony is one of the driving forces down at A&W Electronics, one of the biggest ham dealers in New England.

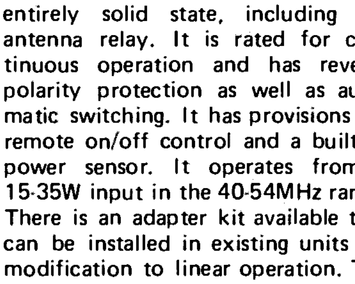
NEW PRODUCTS

100-150W POWER AMPLIFIER

This amplifier, designated Model 6100, employs six silicon transistors and six silicon diodes for years of trouble free service. Each amplifier comes complete with dc and rf cables, instruction manual and the final test data sheet. It is broadband so that no alignment is necessary, has balanced emitter transistors for reliability and is entirely solid state, including the antenna relay. It is rated for continuous operation and has reverse polarity protection as well as automatic switching. It has provisions for remote on/off control and a built in power sensor. It operates from a 15-35W input in the 40-54MHz range. There is an adapter kit available that can be installed in existing units for modification to linear operation. The amplifier also comes with a complete 1-year warranty. One of these amplifiers has been in use at 73 Magazine with excellent results.

For further information contact *JM Communications, 101½ Washington St., Venice CA 90291.*

NEW OSCILLOSCOPE TRI-PROBE



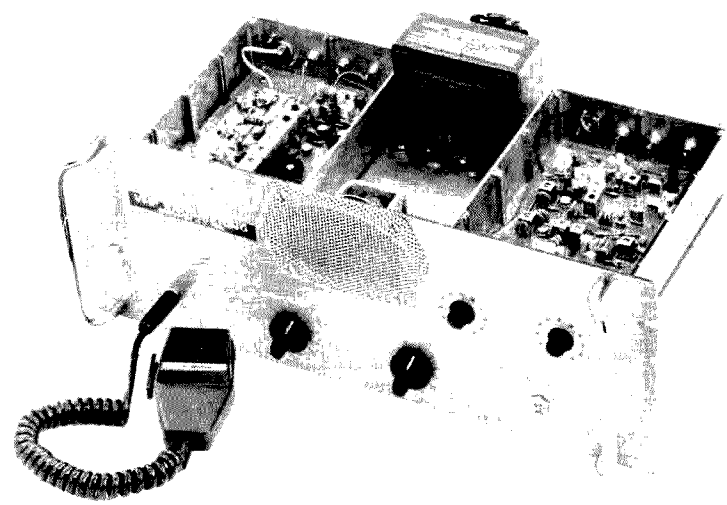
This NEW lightweight probe lets you perform three functions with one, rugged, easy to use oscilloscope probe.

The probe is designed to give you fingertip selection of DEMODULATION, DIRECT or LOW CAPACITY mode of operation for simplified use of your oscilloscope.

Insulation piercing prod for quick, positive contact through wire insulation, solder flux of MIL conformal coatings. Works with any oscilloscope, shielded signal cable is available with PL-259, BNC, banana plugs, or forked lugs to fit any oscilloscope.

For complete information, specifications and price, write *Valor Enterprise Inc., Dept. 203, P.O. Box 1162, Piqua OH 45356.*

VHF ENGINEERING REPEATER



With the cost of repeaters coming down, no wonder the number is growing at the rate of several a day! One of the newest entries is the VHF Engineering package, where a complete repeater can be put together for about $250 – and that even includes the identifier. Several of these repeaters are being used, with one of the newest being WR2ABS in Binghampton NY.

5200 ELECTRONIC INSTRUMENTS

The free 208 page 1974-75 Leasametric Instrument Databook gives spec-by-spec comparisons of over 5200 electronic test instruments. More comparative technical information has been assembled than in any previous publication.

Over 64-pages have been devoted to Rental and Lease information wherein one, two and three month rental rates are presented. Used prices are also given which constitute the "blue book" of the used equipment market.

Additionally, the book provides information on new low cost instruments for sale thru the nationwide "METRIC MART."

For additional information contact *Delight Howell, Leasametric, 822 Airport Boulevard, Burlingame CA 94010. Telephone: 415-347-3067.*

FULL WAVE BRIDGE RECTIFIERS

The MDA100 series of full wave bridge rectifiers are encapsulated in miniature plastic cases of unique design, affording high dielectric strength, vibration and shock resistance, and low cost.

These rectifiers utilize the same dice as the popular and time tested IN4000 rectifier series. Rated realistically at 55°C ambient for full output of 1.5 Amperes, they are available off the shelf, in voltages up to 1kV.

For further information contact the *Technical Information Center, Motorola Semiconductor Products, Inc., Box 20924, Phoenix AZ 85036.*

SIMPLE CRYSTAL SET

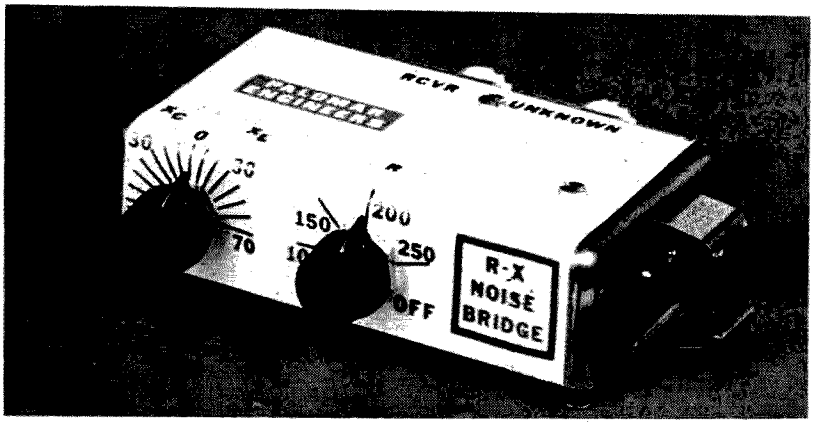
Radio signals from all over the world can be picked up on a simple crystal set designed for shortwave reception. It costs only $10 including postage from Britain. Using neither main nore battery electrical supply, the DX Crystal Set is powered solely by the incoming signal without amplification.

The manufacturer reports that Peking, Moscow, BBC World Service, Prague, Monte Carlo, Cairo and South Africa are among the broadcasting stations that can be received with varying degrees of fading according to aerial location and propagation conditions.

The set consists basically of a germanium diode and a variable capacitor, with two connections and an earth lead to an indoor antenna which also forms the tuned circuit. The antenna, a 15' long double loop of heavy gauge aluminum wire, covers the 49m wave band and part of the 41m band. A progressively narrowing semi-circular scale allows simple tuning over other shortwave bands to be carried out. To improve reception a self-supporting semi-directional antenna can be easily constructed from the same type of aluminum wire. The DX set is housed within a polystyrene case with a matching glossy black and silver front and weighs less than 12 oz.

For further information contact: *Partridge Electronics Ltd. (Mr. G. A. Partridge Managing Director), Broadstairs, Kent CT10 1LD, England. Telephone: Thanet 62535.*

ANTENNA NOISE BRIDGE



The new R-X Noise Bridge by Palomar Engineers measures both resistance and reactive components of antenna impedance. The resonant frequency of an antenna as well as its feed point resistance is easily found.

The ability of the bridge to measure reactance is a useful feature not found in previously available noise bridges. The off-resonance impedance can be measured and it is easy to tell whether the resonant frequency is lower or higher than expected. This greatly simplifies tuning and matching.

The R-X Noise Bridge operates in the 1-100MHz range and measures resistance from 0-250Ω. Price is $39.95 postpaid from *Palomar Engineers, P.O. Box 455, Escondido CA 92025.*

TONE GENERATOR

Looking for a SUBAUDIBLE TONE GENERATOR for your small hand held or portable FM radio? "THE CUBE" is only 1.27cm x 1.52cm x 1.78cm (.5" x .6" x .7") in physical size, but it has a whopping sine wave signal out. Designed to be used with any of the subaudible guarded systems, it works on 9-16V and has no moving parts. It can be set on any frequency between 98 and 240Hz with a trim resistor. THE CUBE is available from RGS Electronics at the low price of $19.95. For an extra $5.00, it can be set on frequency by the factory. Contact *RGS Electronics, 3650 Charles Street, Suite K, Santa Clara CA 95050.*

TURNER CATALOG

An 8-page communication line catalog describing Turner's entire line of communication microphones is now available. It includes several recently developed models.

New products include a special version of the standard Turner M+3 mobile microphone supplied with a 6-conductor cable and wired for Johnson and other transceivers requiring 6-wire cable. Other microphones include the 450 series featuring completely new styling. Several medium impedance microphones have also been added.

Copies of the catalog, No. 2721-C, may be obtained by writing *Turner Division of Conrac Corporation, 909 17th Street, N.E., Cedar Rapids IA 52402.*

UHF TRANSISTOR

A new 12V, 25W ruggedized UHF transistor is now available from TRW Semiconductors, Lawndale CA.

The device, designated TRW PT8825, is a direct replacement for 2N6136 or C25-12 but also features infinite VSWR capability at rated input power and 15.5V. The emitter-ballasted silicon NPN transistor employs a grid structure design to achieve a high figure of merit.

The transistor is intended for land mobile UHF applications up to 512MHz and is especially suitable for radio applications where ruggedized construction is important to protect from antenna mismatches and other current transients.

Units feature low current density for long term reliability and are offered in standard 380 SOE packages. The new transistor can be specified as either TRW PT8825 or 2N6136. Price is $22.50.

For further information, contact *Sales Manager, TRW Semiconductors, 14520 Aviation Blvd., Lawndale CA 90260; phone 213-679-4561.*

THUMBNAIL SIZE SENSOR

This miniature optical sensor by General Electric Company is announced for a host of uses in government, home, business and industry. The tiny solid-state sensor makes possible tubeless TV cameras no larger than a pack of cigarettes and is being produced by *GE's Optoelectronic Systems Operation, Syracuse, N.Y.*

1.5W, 7.5V POWER MODULE

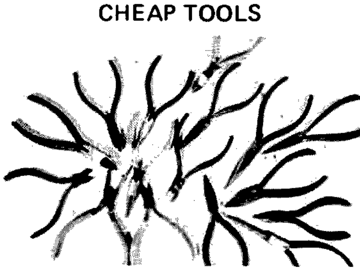
A new line of rf power modules designed specifically for UHF handheld transceivers has been announced by TRW Semiconductors.

The modules, designated MX1.5, are designed to operate from a 7.5V battery supply. They provide 1.5W output, 20dB gain, 50% efficiency and feature full protection against overdrive and load VSWR. Harmonic outputs are more than 30dB down and the MX1.5 is stable under all operating conditions. The modules are designed for operation in the 400-512MHz range and have 50Ω input and output impedances.

The MX1.5 units occupy less than 4 cubic centimeters of space.

For further information contact *Sales Manager, Mobile Products Plant, TRW Semiconductors, 14520 Aviation Blvd., Lawndale CA 90260. Phone: 213-879-4561.*

CHEAP TOOLS



Perhaps inexpensive would be a better title since there is nothing cheap about the tools. Compared to many (if not most) of the imports, these are exceptional. Greene's Electronics down in St. George SC 29477 (Box 626) has somehow managed to get their hands on some seconds from one of the top makers of small tools and they are passing along their good fortune – an assortment of 10 needle nose, cutters and stuff like that for only $16. The assortment has been checked out at 73 and found to be first rate.

MINIATURE BC TRANSMITTER

Telonix Industries has a little 1500 kHz transmitter on the market ($9.95) which is designed particularly to plug into cassette recorders and play them through your broadcast radio. This is not a bad idea for playing Morse code cassettes for a large group, as many radios have a lot bigger speaker and more power than cassette players.

The "Soundcaster" module is about 1.5" high, by 2.5" square, and has a place for a 9v battery in the bottom. It has a plug to fit most cassette players, and a little antenna wire. Dealers might get in touch at 3272 S.W. Temple, Salt Lake City UT 84115.

C/MOS LOGIC ICs

Amperex Electronic Corporation has announced the availability of a series of C/MOS logic ICs in microminiature LID packages. The new series, available from stock in production quantities, consists of 14 logic circuits that have the electrical characteristics of the equivalent 4000 series C/MOS ICs, already widely available in in-line packages, and are functionally interchangeable with those devices.

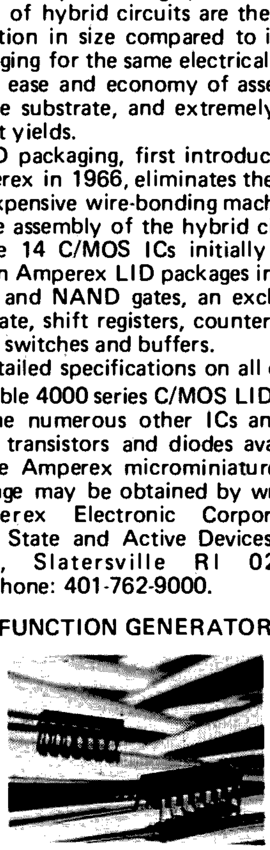
The new Amperex devices have all the recognized packaging advantages of LIDS (Leadless Inverted Devices). The primary advantages, to manufacturers of hybrid circuits are the great reduction in size compared to in-line packaging for the same electrical functions, ease and economy of assembly on the substrate, and extremely high circuit yields.

LID packaging, first introduced by Amperex in 1966, eliminates the need for expensive wire-bonding machinery in the assembly of the hybrid circuit.

The 14 C/MOS ICs initially available in Amperex LID packages include NOR and NAND gates, an exclusive-OR gate, shift registers, counters, flip flops, switches and buffers.

Detailed specifications on all of the available 4000 series C/MOS LIDS and on the numerous other ICs and discrete transistors and diodes available in the Amperex microminiature LID package may be obtained by writing: Amperex Electronic Corporation, Solid State and Active Devices Division, Slatersville RI 02876. Telephone: 401-762-9000.

FUNCTION GENERATOR



Most of the circuitry needed to build precision function generators or signal generators in communications and instrumentation systems is provided by the XR-2206 monolithic function generator. The XR-2206 contains a voltage-controlled oscillator, an analog multiplier and sine shaper, a unity-gain buffer amplifier and a pair of current switches.

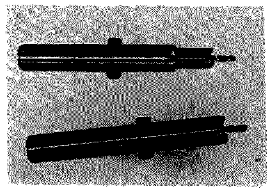
The XR-2206 generates high-quality sine, square, triangle ramp and pulse waveforms with the aid of a simple passive network that biases the circuit and sets operating frequencies. The output waveforms may be amplitude and frequency modulated by varying an external control voltage. Also, logic levels applied to the current switches through an FSK input cause the circuit to operate at two discrete frequencies, such as the mark and space frequencies of an FSK system determined by two timing resistors and a capcitor.

As a precision function generator or sweep generator, the performance of the XR-2206 is comparable to that of a bench instrument. Total harmonic distortion is typically 1% without adjustment and approximately 0.5% with potentiomenter adjustments.

Because of the optional operating modes, the XR-2206 is also ideal as a signal generator in sinusoidal-tone, AM, FM, FSK and PSK (phase-shift keying) systems, as a voltage-to-frequency converter, and as the major component of phase locked loop systems. The XR-2206 is available in 16-pin, dual-in-line packages.

For further information contact *R-OHM Corporation, EXAR Integrated Systems, 16931 Milliken Ave., Irvine CA 92705.*

ISOLATED-PAD DRILL-MILL



The first isolated-pad drill-mills with builtin center drills have been introduced by A. F. Stahler Co.

Another exclusive feature of the Stahler isolated-pad drill-mills is heat treatment of the chrome alloy body of the drill-mills after the teeth are cut. This makes the mills exceptionally long wearing, even when milling isolated pads in glass-epoxy circuit boards.

The tools are used to fabricate circuit boards from full-size templates without etching, to add components to an existing board and breadboard circuits in a form that approximates final design. They are primarily intended for small quantity and experimental circuit board construction by researchers and hobbyists. The isolated-pad technique allows the builder to duplicate circuit templates with identical parts location and wiring layout. The component mounting is as rugged as with etched pc board construction.

After machining the teeth in the mill, Stahler heat treats the tools to a hardness of Rockwell C 44-47, minimizing wear on the mill teeth. The drill is held in place in the bore of the tube with two set screws, preventing accidental breakage of the drill which could be caused by excessive torque if only one set screw were used.

Stahler isolated-pad drill-mills are priced at $7.95 each. Additional information on the tools is available by writing to *A. F. Stahler Co., P. O. Box 354, Cupertino CA 95014.*

W2NSD cont'd from page 111.

and a few thousand dollars worth of prizes doesn't faze him. He knows that the parking chairman is going to have to be ready for hundreds of cars and plans for getting them parked. The flea market chairman is going to have to rope off his area, have help in assigning spaces, take care of complaints, watch out for deadbeats, etc.

All too many hamfests are doomed to mediocrity right from the beginning by being turned over to incompetent management.

STANDARD REPEATERS SELLING WELL

Standard reports that they are up to here in repeater orders, both ham and commercial. Apparently a fair percentage of the new repeater groups are using the Standard repeater. A report from Jordan tells us that the repeater in Amman, JY-73, is still working well and in frequent use by JY1.

HALLICRAFTERS QUITTING?

It does appear that Hallicrafters will follow National and Hammarlund, after all these years, leaving the ham business. Old timers will reminisce over the many fabulous receivers and rigs turned out by Hallicrafters down through the years.

220 ANTENNA

Antenna Specialists has a new 1/4 wave car roof mount antenna for only $7.29 to help you get on the 220 MHz band. It comes complete with 17 foot of RG-58/U coax and UHF connector. The whip is only 13" high for this band, so you won't hit those garage ceilings. It'll handle a hundred watts. Let's get cracking on 220.

NEW HT

More and more of the VHF Engineering hundred buck 2m hand transceiver kits have been getting on the air over the New England repeaters and everyone seems delighted with the project.

The next time someone whines that they would like to get on two meters, but it is just too expensive, tell 'em what's what.

READING HOTLINE?

A recent issue of HOTLINE had two nice $15,000 a year job offers — plus some other interesting jobs. Not to mention some inside FCC scoop that really can't be published in something as widely read as 73 — an honest evaluation of an ARRL move, also not for general publication — inside industry news.

READER SERVICE

Please either tear out this list of advertisers and send it in to 73 with as many boxes checked off as you would like to see brochures, data sheets or catalogs. . .or else make a copy and send that in. Include your zip code, please. Send money directly to advertisers.

ADVERTISER INDEX

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AUGUST 1974

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City ________________ State ______ Zip __________

Coupon expires in 60 days . . . . .

PROPAGATION CHART

J.H. Nelson

Good (open) Fair (☐) Poor (O)

August – 1974

Sun	Mon	Tue	Wed	Thu	Fri	Sat
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EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7A	7A	7	7	7	7	7	7	7	7	7A	7A
ARGENTINA	14	14	7A	7	7	7	14	14	14	14	14A	14A
AUSTRALIA	14	14	7B	7B	7	7	7	7	7	7	14	14
CANAL ZONE	14	14	7	7	7	7	14	14	14	14	14	14A
ENGLAND	7	7	7	7	7	7	14	14	14	14	14	14
HAWAII	14	14	7B	7	7	7	7	7	14	14	14	14
INDIA	7	7	7	7	7B	7B	7	7	7A	14	7A	7
JAPAN	14	7A	7	7	7	7	7	7	7	7	7	14
MEXICO	14	7A	7	7	7	7	7	14	14	14	14	14
PHILIPPINES	14	7A	7B	7B	7B	7B	7B	7	7	7	7	14
PUERTO RICO	14	7	7	7	7	7	7	7A	7A	14	14	14
SOUTH AFRICA	7	7	3A	7	7B	14	14	14	14	14	14	7A
U. S. S. R.	7	7	7	7	7	7B	14	14	14	14	14	7B
WEST COAST	14	14	7	7	7	7	7	14	14	14	14	14

CENTRAL UNITED STATES TO:

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ALASKA	14	14	7	7	7	7	7	7	7	7	7A	14
ARGENTINA	14	14	14	7	7	7	7A	14	14	14	14	14A
AUSTRALIA	14	14	14	7B	7	7	7	7	7	7	14	14
CANAL ZONE	14A	14	7	7	7	7	7	14	14	14	14	14A
ENGLAND	7	7	7	7	7	7	7	7	7A	7A	14	14
HAWAII	14	14	14	7	7	7	7	7	14	14	14	14
INDIA	7A	7A	7	7	7B	7B	7B	7B	7	7	7	7
JAPAN	14	14	7A	7	7	7	7	7	7	7	7	14
MEXICO	14	7	7	7	3A	3A	7	7	7	7	14	14
PHILIPPINES	14	14	7A	7B	7B	7B	7B	7	7	7	7	14
PUERTO RICO	14	14	7	7	7	7	7	14	14	14	14	14
SOUTH AFRICA	7	7	3A	7	7B	7B	14	14	14	14	14	7A
U. S. S. R.	7	7	7	7	7	7	7	7	14	14	14	7

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7A	7A	7A	7	7	7	7	7	7	7	7	7
ARGENTINA	14	14	14	7	7	7	7	14	14	14	14	14A
AUSTRALIA	14	14A	14A	14	7A	7	7	7	7	7	14	14
CANAL ZONE	14	14	7	7	7	7	7	14	14	14	14	14
ENGLAND	7	7	7	7	7	7	7	7	7A	7A	14	14
HAWAII	14	14A	14A	14	7A	7	7	7	14	14	14	14
INDIA	7A	14	14	7	7B	7B	7B	7B	7	7	7	7
JAPAN	14	14	14	7A	7	7	7	7	7	7	14	14
MEXICO	14	14	7	7	7	7	7	14	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	7	7	7	7	14
PUERTO RICO	14	14	7	7	7	7	7	14	14	14	14	14
SOUTH AFRICA	7	7	3A	7	7	7	7	7B	14	14	14	7A
U. S. S. R.	7	7	7	7	7	7	7	7	14	14	7	7
EAST COAST	14	14	7	7	7	7	7	14	14	14	14	14

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

one dollarette
SEPTEMBER 1974

73 magazine
for radio amateurs

FCC goes WILD!

FIVE DOCKETS RELEASED — *Full Text Inside*

The FCC has swung from the overly restrictive stance of last year to overt cooperation and interest in amateur problems and growth — blessings on Walker — on Chairman Wiley — on Johnny Johnston — and Gary Hendrickson. Yes, blessings on Walker! Things are looking up . . . read the full text of these Dockets in this issue and send in your comments. . .

- UNATTENDED REPEATERS

  Fallout from the January 14th FCC Amateur Hearing is this Docket to permit repeaters to be automatically controlled.

- REPEATER CROSSBANDING

  More Hearing Fallout — the promised elimination of the restrictions against crossbanding. This may be the biggest shot in the arm imaginable for 220 MHz development.

- COMMEMORATIVE STATIONS

  Further relaxation of the FCC opposition to special call sign stations. Three more cheers!

- SPECIAL CALLS FOR EXTRAS

  This could make the Extra Class ticket very *desirable.*

- DELETING STATION LOG REQUIREMENTS

  Another needed change — more cheers!

inside . . .

73 magazine for radio amateurs

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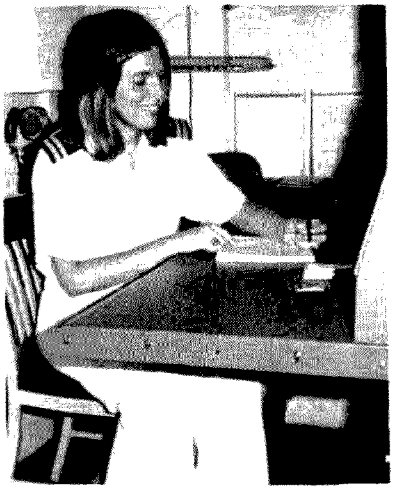
Amateur Radio

Monthly Ham



YL MARITIME OP

(ed note. . .Gloria Vader made the news recently as the first YL maritime op – she is the radio officer on the U.S. Geological Survey ship S.P. Lee out of Redwood City, California. A note from 73 asking her about this brought this reply. . .)

Thank you for your interest in my new career. I would like to see more women become interested in both ham radio and going to sea. I became interested in ham radio while living with friends on a schooner in Mexico. Their ham rig was communication with their friends in California who were helping them get materials for work on the boat. When they first bought the boat in Columbia they almost lost her on the way to the canal; but they contacted someone on the ham rig in New Jersey, who in a round about way got a hold of the Panamanian Coast Guard. The Coast Guard flew out a pump. Since then I've learned more about what a valuable communication tool amateur radio is and has been on land and sea. My ham experience helped me when I began to learn commercial operating procedures. Also, I was all ready familiar with the language of electronics, and it was easier to learn the servicing techniques I need for my job. So amateur radio has done a lot for me besides being an enjoyable hobby.

I'm enclosing a picture one of my friends in the crew took during an open house on the ship I don't usually wear a uniform as the atmosphere is mere casual.

WBØKVL

HAM STATION FOR BLIND HAMS
Set up by local club

Blind amateurs who are taking the guide dog training course at the Blind Center in San Rafael CA now can talk through the local repeaters as a result of the kind work done by the members of the George S. Ladd Pioneer Radio Club in San Francisco. The club set up a G.E. Progress line rig and antenna for the school.

Watch for the station via WR6ABM or WR6ACS when you're in the area.

ED CLEGG AVAILABLE
(for talks)

Ed Clegg W2LOY is not only one of the top VHF equipment designers in the country, he is also one of the most enthusiastic supporters of the ham use of the 220MHz band. Remember that Clegg was the first out with a 220 transceiver – and with a 220MHz repeater. These were not put out with that CB band in mind indeed they weren't ever designed to work with anything but ham use of the band.

The Clegg 220 repeaters are being set up in more and more areas, with the units in Totowa and Oakland, New Jersey being two of the latest. Many repeater clubs are going for the Clegg repeater/rig package, with the support of their local dealer.

Ed has been making trips to speak to clubs about the 220 band. If your club would be interested in hearing this expert of the experts you might have the program chairman get in touch with Carl Jacobsen at Clegg, 3050 Hempland, Lancaster PA 17601, and see if something can be arranged.

With the 2m repeater channels filling up in many areas, 220 is beginning to look better and better to a lot of groups.

HAMS AID SOAP BOX DERBY

The Kent County Repeater Association helped provide communications for the 13th annual Grand Rapids Soap Box Derby using 2m simplex. Public services such as this are of great value to the image of amateur radio. What has your club done?

SECOND ANNUAL HOBBIES EXHIBITION

More than 30,000 people visited the second annual hobbies exhibition sponsored recently by the "Sydney Morning Herald," Sydney, Australia. Several complete amateur stations were set up with a number of contacts made in Australia and New Zealand.

Dick Smith Electronics of Sydney provided the 80–10 meter SSB transceiver and three two meter stations as well as a complete electronics display and some 17,000 brochures on amateur radio and electronics.

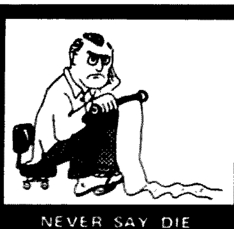
Tom King, WA7DPO/VK2ATJ/T, left, manned the booth for 70 hours along with members of the University of New South Wales Amateur Radio Society, VK2BUV. Several hundred genuine enquiries on obtaining an Australian amateur license were answered.

HAM GEAR FOR JORDANIAN CLUBS

Anything you can spare in the way of ham gear, test equipment, good spare parts will be invaluable to the youngsters in Jordan. No junk, please – it is too costly to ship junk over there. Help a ham in Jordan to get on the air. Send equipment to: Royal Jordanian Radio Amateur Society, Royal Palace, Amman, Jordan; c/o Embassy of Jordan, 2319 Wyoming Avenue, Washington DC. Please send a copy of the equipment sent to 73 Magazine.

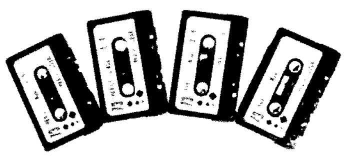
WS1ACR SPECIAL EVENTS STATION

The Newport County Radio Club will be operating this station in conjunction with the America's Cup Races through Sept. 30th. All bands, CW and SSB, plus 2m and AM on 6m. QSL to Box 36, Broadway Station, Newport RI 02840.



...de W2NSD/1

EDITORIAL BY WAYNE GREEN



VIVA CASSETTES!

The Scott Joplin music from The Sting got to me right away – as it did millions of others – so I was ready, ready, ready when I got a call from an old friend offering a ticket to a Scott Joplin concert at Dartmouth in Hanover, New Hampshire. The New England Ragtime Ensemble was playing.

Not knowing that there would be any flack over my making a tape of the concert I arrived with a miniature Toshiba (KT-270) cassette recorder with a built in condenser mike and a lantern battery for extended drive since the little AA batteries it uses run out in about a half hour or so. I held the recorder in my lap about 150 feet from the stage, about half way back in an audience of about 2000.

They took the recorder away about an hour into the concert. Next time I try that I'll keep the recorder in a bag under the seat and use a small inconspicuous mike. Well, I did get an hour of a really fantastic concert, complete with the wonderful comments by Gunter Schuller, the conductor, and that was worth all the trouble.

I played the tape all the way home on the car hifi system which I originally set up for slow scan mobile operation. Since then I've gotten a couple records of the same group, but somehow they sound a lot better with the live audience – the performers get carried away by the enthusiasm of the listeners – it was mass hysteria – they kept Schuller and the group playing encores for almost an hour after the concert was supposed to be over – an incredible reaction.

The more I look into cassette tapes, the more convinced I am that they are going to be really big in a year or so. Not too many people realize that the state of the art has advanced now to where cassette tapes are comparable with the expensive reel to reel tape decks in fidelity. Cassettes have a lot to offer over records now. Even with the best of record players a record wears audibly after just a few plays – a tape does not wear, even if played on a real cheap recorder.

But what about the tremendous investment people have in records? I might give that more consideration if I had not suddenly found myself with hundreds upon hundreds of completely obsolete 78 rpm records a few years back. If they ever come back, I can retire.

Cassettes play just fine in a car, in a portable hand unit, or in the finest hi-fi player. There is no needle to jump, no vinyl to attract dirt and get scratched. Cassettes are easy to store – I carry around two little cases which hold 20 cassettes each in the car – 4" wide by 2-1/2" high by 10" long. I'll leave it to you as to how much room 40 albums would take in the car – make that 60 albums since the cassettes each have 60 minutes of music to 40 minutes per album. I'm not sure they would even fit in my little Datsun Z-car.

On records you can play any cut you want, how about cassettes? Most of the better recorders have a counter on them and with this you can cue in easier than you can find the right groove on a record. I put the counter reading on the cassette index and this allows me to go exactly to where I want in seconds. Most decks take a minute or even two for fast wind or rewind, but some of the newer ones have cut that down to 30 seconds for a half hour of tape! And they are virtually foolproof too. You can go from fast forward to fast rewind instantly without spilling or hurting the tape.

I predict that cassettes will be the major program source in five years. Let's see how I do with this one.

Eight track? No way. You can't reverse it and that endless tape system gets snagged much too easily. 8-track may possibly be around for pops about the way 45 rpm records are, or it may just go away in the face of cassette superiority.

The ability to tape music (or anything else) off the air – from borrowed records – from live concerts – or from other tapes in another big plus over vinyl records. The shortage of vinyl is another factor since cassettes take much less raw material – about 1-1/4 oz for a cassette to 4-1/2 oz for a record. That makes any 40 cassettes in the car weigh in at around three pounds and the sixty LP's with jackets at over 30 pounds. Convinced?

WALKATHON ALTERNATIVES?

Walkathons are becoming very popular and quite a few ham clubs – particularly FM repeater groups – have been providing communications for them.

When I first heard about walkathons, I had a hard time believing that they would catch on – they seemed so totally unproductive – so completely wasteful. The idea of paying money to a charity because someone walks so many miles didn't make much sense. Other groups had tried getting people together to do positive things such as cleaning up roadways, rivers and streams, vacant lots, or to paint buildings, and this seemed a lot more reasonable to me.

If any of you look at things the way I do, perhaps you will have a chance to convert an incipient walkathon or bikathon into something more constructive. Then, not only will the participants get something of value done, but the charity money will help too. There are few communities where it would not be beneficial to have the beer cans picked up along the back roads – where there aren't houses that people would love to have painted for the cost of the paint and brushes – where enthusiastic, if inexperienced, help could help the community.

A little imagination will go a long way on projects like this. You may

W2NSD/1 cont'd on page 136

FCC NEWS

RM-2382

In the matter of

Amendment of Part 97 to delete certain amateur radio station log requirements.

Adopted: June 25, 1974

By the Commission:

1. The purpose of this Order is to amend the rules for the Amateur Radio Service to delete requirements for certain information to be entered into the log for an amateur radio station.

2. The Maryland FM Association, Inc., in petition RM-2382, requests amendment of §97.103 in order to effect such deletions. Petitioner claims the practical aspects of maintaining a station log at times can be very cumbersome and inconvenient. They point out other services regulated by the Commission where logs are not required, and question if amateur station logs are essential to the Commission's task in inspecting amateur stations and reviewing their operation.

3. The logs required by §97.103 do not, in fact, play a major role in the Commission's enforcement efforts, and we have no information on the role they play in the amateurs' self-enforcement efforts. A station log is sometimes presented to the Commission by an amateur operator attempting to prove, or disprove, some aspect of his past operation. For instance, he may wish to prove his station was not in operation during a period for which a complaint was received or a violation of the rules was observed. Or he may wish to prove he had accumulated the operating time required by §97.13(a) at the time of license renewal. A well kept log can, therefore, serve the amateur operator. For this reason, we feel most amateurs will probably continue to log data in addition to that required, a conclusion shared by the petitioner.

4. The present rules do provide exceptions to the logging requirements, most notably for those stations in mobile operation. The underlying purpose for this exception is safety considerations during times the amateur is simultaneously driving an automobile and operating an amateur station. There has been no noticeable impact resulting from this exception, and based upon this experience, it can be predicted there will be no significant degradation of the Service by extending the relaxation.

5. Petitioner recommends rule provisions such that, in specific instances, a station may be required to enter additional information into the log as may be deemed necessary by the Commission. We are in agreement with their suggestion. Furthermore, we believe the following should be logged: the location and dates for any operation, except mobile; signatures of visiting control operators; and third party traffic. Petitioner states his agreement with these requirements.

6. The amendments are given in the Appendix. It should be noted the requirements for logging certain technical data in §97.111(f) remains unchanged. The amendments adopted herein are editorial revisions, and deletions and relaxations of existing rules provisions which we consider no longer necessary. We believe they will inure to the benefit of many and to the detriment of none, and they will better serve the public interest. Therefore, prior notice of rule making and effective date requirements are unnecessary, pursuant to the Administrative Procedure and Judicial Review provisions of 5 U.S.C. 553(b)(3)(B).

7. Therefore, IT IS ORDERED, that, pursuant to §§4(i) and 303(j) and (r) of the Communications Act of 1934, as amended, Part 97 of the Commission's Rules and Regulations are amended as set forth in the attached Appendix, effective July 10, 1974. IT IS FURTHER ORDERED that RM-2382 is TERMINATED.

APPENDIX

§97.103 of Chapter I of Title 47 of the Code of Federal Regulation is amended to read as follows:

§97.103 Station log requirements.

An accurate legible account of station operation shall be entered into a log for each amateur radio station. The following items shall be entered as a minimum:

(a) The call sign of the station, the signature of the station licensee, or a photocopy of the station license.

(b) The locations and dates upon which fixed operation of the station was initiated and terminated. If applicable, the location and dates upon which portable operation was initiated and terminated at each location.

(1) The date and time periods the duty control operator for the station was other than the station licensee, and the signature and primary station call sign of that duty control operator.

(2) A notation of third party traffic sent or received, including names of all third parties, and a brief description of the traffic content. This entry may be in a form other than written, but one which can be readily transcribed by the licensee into written form.

(3) Upon direction of the Commission, additional information as directed shall be recorded in the station log.

NOTICE OF PROPOSED RULE MAKING

DOCKET NO. 20092

In the matter of

Amendment of Part 97 to make Special Call Signs available to stations licensed to Amateur Extra Class operators.

Adopted: June 26, 1974

By the Commission:

1. Notice of Proposed Rule Making is hereby given in the above captioned matter.

2. Frequently, the Commission receives a request from an amateur radio operator asking to have a specific call sign, or call sign format, assigned to his amateur radio station. The reasons given to justify these requests vary, but the requests in themselves indicate the very special significance a station call sign can hold for an amateur operator. Under the present rules, there are no provisions for satisfying requests of this type.

3. While we would like to be able to assign every amateur station the exact call sign of the licensee's choice, there are practical limitations imposed by administrative considerations. The assignment of station call signs on a request basis would require new processing systems requiring more clerical manpower, since most call sign assignments are now made by automatic data processing methods. Additionally, more manpower would be required to resolve conflicts arising from the inevitable cases of several amateurs desiring to obtain the same particular call sign. For reason such as these, under our present systems and resources, we could not possibly offer to assign call signs on a request basis to all of the 265,000 amateur radio stations now licensed.

4. Until such time as the necessary systems and resources may become available, we believe it is possible to satisfy at least some of these requests. The Amateur Extra Class deserves first consideration in this matter. This group represents the highest skill level licensed in the Amateur Radio Service. Since they also represent the operator class having the smallest

number of stations (over 14,000), and since many, if not most, of these stations already have preferred call signs or call signs of long standing, the number of requests for special call signs should come within reasonable limits. Making special call signs available to this group should provide amateurs, and the Commission, with information and experience in this matter so any future possibility of expanding the system can be better considered. Moreover, it would offer amateurs a way to obtain the call sign of their choice for their station.

5. Therefore, we propose to amend the applicable sections of Part 97, as shown in the Appendix. The current 25 year eligibility requirement for a 1X2 (single letter prefix, two letter suffix) call sign would be deleted. The amateurs meeting the 25 year requirement have had ample opportunity to exercise this option. The manpower recovered from deleting this provision can be applied to administering the proposed new system. Under these proposals, *any* Amateur Extra Class licensee would be eligible to apply for and receive *any* available station call sign of his choice, including 1X2, 1X3, or 2X3 formats, consistent with the numeral designated for the area. The limitations on only one 1X2 format call sign per licensee, except for those already holding more than one, would remain. However, the same licensee would be eligible to also hold one or more 1x3 or 2x3 format station call signs.

6. The proposals would undoubtedly result in the limited number of 1X2 format call signs becoming rapidly exhausted. This eventuality is only a few years off anyway, since the number of amateurs completing 25 years in the Amateur Radio Service should begin to increase sharply, reflecting changes in the operator license structure in the early 1950's. For this reason, we are proposing to delete the availability of in memoriam call signs to club stations. This will make a few more 1X2, and even desirable 1X3, format call signs available for the proposed system. Additionally, verification that the deceased former licensee was actually a member of the organization has, at times, been difficult for both the club and the Commission. Again, the manpower recovered from this deletion can be applied to the proposed new system.

7. The Commission has a number of petitions on file concerning the assignment of amateur station call signs. This proposal is not intended to preempt future consideration of those petitions. In fact, should our proposal be adopted, the resulting experience will enable us to better consider these petitions. Only call signs having prefixes in the series now normally assigned to primary and secondary stations would be available initially, although additional prefix series may be added at a future date. Available immediately would be those having the prefix K, W, WA and WB, in addition to those call signs normally assigned to stations not within the 48 contiguous United States. For stations outside the 48 contiguous United States, only a choice of call sign suffix could be made.

8. Authority for the proposed rule changes herein is contained in §§4(i) and 303 of the Communications Act of 1934, as amended.

9. Pursuant to applicable procedures set forth in §1.415 of the Commission's Rules, interested persons may file comments on or before October 9, 1974 and reply comments on or before October 24, 1974. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision on the rules which are proposed herein, the Commission may also take into account other relevant information before it, in addition to the specific comments invited by this Notice.

10. In accordance with the provision of §1.419 of the Commission's Rules and Regulations, an original and 14 copies of all comments, pleadings, briefs or other documents shall be furnished the Commission.

11. All filings in this proceeding will be available for examination by interested parties during regular business hours in the Commission's public reference room at its headquarters in Washington, D.C., (1919 M Street, N.W.).

APPENDIX

Part 97, of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

§97.51(a)(3) is deleted and reserved, and §97.51(a) and §97.51(a)(5) are amended to read as follows:

§97.51 Assignment of call signs.

(a) The Commission will systematically assign every amateur radio station a call sign consisting of a sequence of two letters, a numeral, and three letters, with the following exceptions:

(3) (Reserved)

(5) Upon request for a Special Call Sign, any available unassigned station call sign may be assigned to a primary or secondary station licensed to an Amateur Extra Class operator.

2. §97.53 is revised to read as follows:

§97.53 Policies and procedures applicable to the assignment of call signs.

(a) An eligible licensee will be permitted to hold only one two-letter call sign. However, licensees who, by reason of former rule provisions, presently hold more than one such call sign may continue to hold those call signs in the same call sign areas.

(b) Subject to availability, a primary station will be assigned the same type of call sign as the one relinquished, upon modification of license to show the fixed station operation location in a different call sign area.

(1) Stations will not be assigned specific call signs of the licensee's choice, nor counterpart call signs (call signs having identical suffix letters), under this provision. However these limitations will not preclude qualification for a Special Call Sign.

(2) When a two-letter call sign is not available in the new call sign area, an eligible licensee may be assigned an available unspecified three-letter call sign.

(c) Call signs which have been unassigned for more than one year will normally be available for reassignment.

FCC's FERRARO W3VGU RETIRES

Samuel J. Ferraro, Electronics Engineer in the Amateur and Citizens Division, is retiring on June 30, 1974, after thirty years of government service all with the Federal Communications Commission except for four years in the U.S. Navy during World War II.

Sam was responsible for much of the early repeater application processing and was most helpful in help-

ing repeater groups through the maze of restrictive and conflicting regulations which managed to bog down about 90% of the early applications.

This job has now been taken over by Gary Hendrickson W3DTN, a repeater afficionado, and licenses are being processed under the new and much relaxed rules in record time. For example, one recent repeater license application went through and the call was issued in about 30 days! This was WR1ADX in Wolfeboro, New Hampshire.

Sam was ever helpful to amateurs and he will be missed, Perhaps in his retirement he will have more time to join us on the air. . .maybe on some of the repeaters he helped to license.

More FCC · Cont'd

450 BAND SECURE!
Emergency Medical Band Kaput

The FCC has announced the decision not to take any of the amateur 450MHz band for the Emergency Medical Service. A great sigh of relief has risen from the many groups with 450 repeaters and 450 control systems. The EMS will undoubtedly go right ahead, but on a much higher frequency band. This may be somewhat frustrating to Motorola, who we have heard has already produced some equipment designed for use in the proposed 450 EMS band.

AMSAT PRESENTATION BEFORE FCC

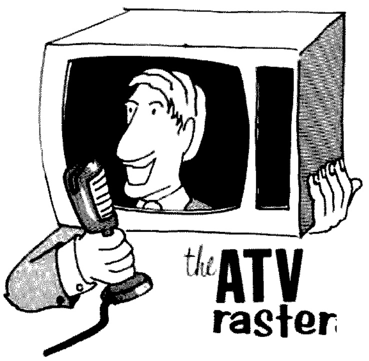
On July 9th Perry Kline of Amsat gave an interesting presentation before approximately 30 members of the FCC in Washington. That amateurs have been able to accomplish so much with such minimal expenditure is a continuing source of amazement to government officials. The fellows working on the Oscar projects beg, borrow and. . .ahem . . .just about everything from the solar panels to the batteries to the piggy back ride into space. One FCC insider said that the general reaction of the FCC people was that if Oscar wasn't up there right now they wouldn't believe that such a thing was possible.

REPEATER APPLICATIONS CONTINUING

978 repeaters were licensed as of July first. . .and 225 applications for more licenses were in hand at that time. . .all of them already processed by the Washington staff (Gary Hendrickson W3DTN). The FCC is beginning to wonder where all of these repeaters are going to be used. So are the frequency coordinator teams around the country. The elements for chaos are there. . .will the ARRL be able to keep things in hand now that they have successfully kept repeater councils from organizing into a group separate from the ARRL? Time will tell.

FCC's UNIVAC PROBLEMS

The amateur "service" apparently has won the honor of being the first to be transferred from the old Univac computer to the new computer system. A changeover like this never in history been made smoothly, so be prepared for difficulties for a year or two until things settle into place.



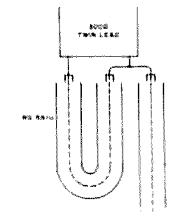
Terry Fox WB4JFI
3612 Barcroft View #302
Baileys Crossroads VA 22041

I have talked to several ATVers in our area that are having trouble picking up or transmitting to our repeater, and in every case it has turned out to be a problem in his setup. The UHF bands aren't that hard to work in, but more care must be taken in setting up a station than with the lower frequencies. Time after time I have seen a station using RG-58U as lead in, no balun, a commercial TV antenna polarized wrong, or some other poor hookup. I will try to show a basic setup that has been proven a good one again and again.

We'll start at the antenna. It should be one that has good gain, relatively high bandwidth, and rigid mechanical construction. It should be high enough to be out of the trees (we have one ham that was putting out a great signal until the trees by his antenna blossomed), however, UHF can run in sort of ducts, so you can get too high.

At the very least, RG-8U should be used, and it shouldn't be used much over 50 ft. Over 50 ft. lower loss cable should be used, because every db counts. This also shows that an antenna can get too high, because the loss in the cable will overcome the gain resulting in the increased height.

For receiving, the next item is going to be a balun. This should not be one of the commercially available ones, as at 450MHz they act as 10dB pads. One of the ATVers in this area came up with the design shown. It seems to work a lot better for us than any commercial ones that we've tried, and it's very easy to make.



1. Cut 21cm (8 3/8") length of RG 59/U.
2. Make a loop and strip each end of jacket 1.5cm (1/2").
3. Take a piece of RG 59/U of any needed length and strip one end 1.5cm (1/2").
4. Unbraid three outer braids of stripped ends and solder together. Do not overheat.
5. Take piece of 300Ω twin-lead and strip one end 1.5cm (1/2").
6. Solder one side of the twin-lead to the inner conductor of one side of the loop and the inner conductor of the random length of RG-59/U.
7. Solder the inner conductor of the other side of the loop to the other lead of the 300Ω twin-lead.
8. Use black vinyl tape to cover connections and hold loop to random length of RG-59/U.
9. Make continuity check with ohm meter — both leads of other end of twin-lead will be connected to center of coax and no connection will be made to braid.

If a preamp is needed, it will come next, and it should be designed for the ham band rather than for broadcast TV because they don't work too well on our frequencies. Also, more than about 20dB gain won't do you any good for the video link, from our experiences. There are several available that are advertised in 73, and any of these will work good on ATV, as long as you specify it's for TV use when ordering.

The receiving converter is possibly the most critical part of the whole station. The Blonder-Tongue converter seems to be the best approach at this time. We have compared them to the T-44 receiver strip, and the converter has won out every time. The T-44 just doesn't have comparable sensitivity, and it's not quite as broadbanded. The other possibility is a homebrew unit, but I feel that it's not worth the frustration when the Blonder-Tongue units are so readily available.

The last section for receiving is the TV set, which should have good sensitivity on channel 2 or 3 whichever you choose for the i-f into it. I have a black and white set that I use only for ATV, so it's tuned up for best sensitivity on channel 2, which is the i-f out of my converter.

The transmitter can be a RCA CMU-15, Motorola T-44, or a homebrew transmitter. As far as we can tell, the CMU-15 with the WØMZL modulator seems to put out the best overall picture. The T-44 is close, but it isn't quite as good for resolution. Not only that but the T-44 needs a more sophisticated power supply. In any case, I highly recommend the WØMZL modulator for any transmitter. Another word of caution regarding the T-44, some have the normal 15 pins, while a few have 18 pins, so check your unit before hooking the power up.

Several hams interested in ATV have been visiting the D.C. area and

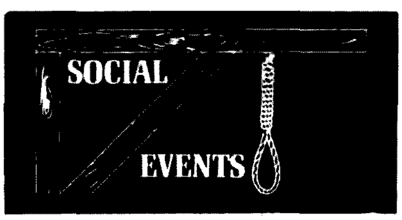
while here have contacted us and have been shown the ATV repeater. If anyone is interested in ATV, and is visiting D.C. please get in touch and we'll be glad to show off the machine itself, and what it looks like on the air from a home QTH.

Some interesting integrated circuits have been introduced recently, and I'm sure the more advanced ATVers will be very happy to hear about them. Two that I've heard about are both sync generators. One is the Fairchild 3261, which is available in both black and white ($35.00), and color ($47.00) versions. While this may seem kind of high at first, when you realize that all you need besides this chip is a 14MHz clock and a couple transistors for a complete broadcast-grade house sync generator, the price seems a lot better. The other sync gen chip is made by National, and its number is MM-5320. I haven't been able to get a spec sheet on it yet, but I think it's probably very similar. I will be writing more about these as I experiment with them. Another cute little device that I'm playing with is a Motorola MC 1445G. This is a high bandwidth video switch. and it lends itself very nicely to being the key part of a special effects generator (pun intended). Anyone interested in playing with this IC should ask Motorola for applications note number AN-491, as it explains how to properly use the chip.

Another area of interest to ATVers seems to be a relatively low cost 450 band solid-state transmitter with both audio and video. I'm sure there is someone out there that can work on this, as it would be of great value to the expansion of ATV. Again I am playing with some circuits for this but I have so many other things going on that I have no idea when it would be completed. From what I can tell, it would probably be best to start around 109MHz and double twice. This way you not only don't interface with 2 meters, but you also don't put junk out on TV channel 4. We have had this to be our only interference problem, and we traced it to the 72MHz stage in the T-44.

I guess I'll wrap this up for now and continue next month. Till then: BCNU on 439 ATV.

...WB4JFI



HARRISBURG PA

Sunday, Sept. 22, Park-N-Shop parking lot, 200 Block Walnut Street, Harrisburg — be there for the first high-rise hamfest in the world! 11 levels of parking — $2 per ham — 9AM — talkin on 94, 52 and 16-76.

QCWA NATIONAL CONVENTION
Disney World

October 25–26 — make plans now to attend this QCWA National. Write W4UKA, 635 SE 19, Ocala FL 32670.

MONTREAL AUG 4

Big Hamfest 9–5 on Sunday Aug 4th at MacDonald College Farm, Ste. Anne Bellevue, which is on the west end of Montreal Island. $2.50 admission. Talkin on 76, 58, 28–88, 46–06, and 6.40 7.18. Fleamarket, tech sessions, prizes, picnic.

SAN DIEGO NOV 1–3

ARRL SW Division convention — Town and Country Hotle — talk in 34-94, 3900, 7250. $5.50 registration, $9.75 banquet. Write Box 82297, San Diego CA 92138 for info and pre-registration details.

VA DX CONVENTION

Saturday Sept. 28, Sheraton Inn, Reston VA (near Washington). Sponsored by the National Capitol DX Association. Write DXpo 74, R1, Box 207A, White Plains MD 20695 for registration.

TACOMA HAMFEST

Aug. 17–18 at the Pierce County Fairgrounds, 11 mi south of Puyallup in Graham, Washington. Tech sessions, prizes, contests, flea market, displays. Registration S4, including dinner $7. Write Bill Morgan W7GPR, 3421 E 138, Tacoma WA 98446.

MEMPHIS TENN, OCT 6

The Mid-South Amateur Radio Association is sponsoring the Memphis Hamfest on Sunday October 6 at State Technical Institute, I-40 at Macon Rd (Exit 11). Seminars, demos, displays, XYL program, prizes, flea market, fun. Talk in 3980, 34/94, and Army Mars. Trailers and campers hookup at Welcome Inn across street. Holiday Inn there too.

RTTY ART CONTEST
Sept. 1 to Oct. 31, 1974

Entries in the contest should be sent to Don Royer WA6PIR, 16387 Mandalay Drive, Encino CA 91316. Send a five-level tape and five prints of each entry — as many entries as you want — winning entries will be published in 73 Magazine. Write Don with SASE for the full set of rules.

WINNIPEG MAN. OCT 5-6

Hamfest "74," International Inn, Winnipeg. Reg to VE4RL, Box 352, Winnipeg Man. Can. R3C 2H6 $1 ea. Dinner and dance Sat. $4 each. Hotel $24 couple special. Xmtr hunt, mobile contest, homebrew contest, XYL events, big prizes, auction.

WE4ARE SPECIAL EVENT STATION

Richmond Telecommunications Society sponsored booth at Atlantic Rural Exposition Sept. 19-29. Look on 3988, 7288, 146.88. QSL Box 842, Richmond VA 23207. Visitors can get nice prizes.

RESTON VA SEPT. 28

DXpo 74 — DX convention at Sheraton Inn, Reston VA sponsored by the National Capitol DX Association. Banquet, DX sessions, YL program, info: W3BWZ, RI B207A, White Plains MD 20695.

WEST GHENT NY OCT. 5

Northeast States 160 Meter Association annual fall meeting at Kozel's Restaurant, West Ghent (near Hudson). Flea market, dinner, prizes, starts 2 pm. Dinner $5.75 ea. — reservations: W1JEC, Box 44, West Granby CT 06090.

SO. SIOUX CITY NB, OCT 4-5-6

The ARRL Midwest Convention will be held at the Marina Inn, South Sioux City NB sponsored by the 3900 Club. Theme — tribute to handicapped amateurs. Friday noon start. QCWA dinner, portable repeater, SSTV, ATV, Amsat demo, QRP session, ARRL forum, repeater forum, traffic forum, flea market, Mars, exhibits. $7 reg to WØEQN 3818 5th Avenue, Sious City IA 51105. Banquet $6.

SHARON AUCTION SEPT. 15

The Sharon Amateur Radio Association is holding an auction on Sunday, September 15, at 1PM at the Sharon Community Center on Massapoag Avenue, Sharon MA. Free refreshments and doorprizes. Sell your own gear — we take 10%. For more info please contact Ed Levine WN1RFD, 6 Carlton Road, Sharon MA 02067. (617) 784-6033.

CINCINNATI OH SEPT. 15

The Greater Cincinnati Amateur Radio Association sponsors the Cincinnati Hamfest at Stricker's Grove (State Route 128, Ross). Dinner, contests, prizes, exhibits, beer, fun. $7 at the gate. Hot dogs and buns all day, donuts and coffee until noon, beer and pop all day. Dinner and supper from 11:30AM to 5:30PM.

Social Events cont'd on page 10

repeater update

Revision of Recently Published Repeater Atlas

ALABAMA

WB4QFV	Albertville	6.16-6.76
WB4QFF	Andalusia	6.34-6.94
WR4ABH	Montgomery	6.16-6.76
WR4AGN	Opelika	52.76-52.525
		6.34-6.94
WR4AEH	Tuscaloosa	6.22-6.82

ALASKA

WR7ACT	Anchorage	6.16-6.76

ARIZONA

WR7ACK	Bisbee	6.16-6.76
WR7ABL	Phoenix	7.60-7.00
WR7ACC	Phoenix	52.576-52.525
WR7ADG	Show Low	6.34-6.94
WR5ABF	Texarkana	6.22-6.82
WR7ABM	Tucson	6.34-6.94

ARKANSAS

WR5ADI	Little Rock	6.34-6.94
		6.10-6.70
		449.45-444.20
WA5BRF	Hot Springs	6.28-6.88

CALIFORNIA

WR6ADI	Auburn	6.16-6.76
W6IWY	Canoga Park	6.31-6.91
WR6ACI	Crestline	6.25-6.85
		6.19-6.79
WR6ICB	Eureka	6 34-6.94
WR6DGJ	Eureka	6.34-6.94
		6.94-7.48
W6JPU	Fresno	6.12-7.71
		6.22-6.82
W6PXP	Fresno	6.19-6.79
WR6AFA	Fresno	7.90-7.30
WR6ABV	Los Angeles PL	7.78-7.18
		442 450
WR6ABC	Los Angeles	222.34-223.94
WR6AEG	Los Angeles PL	7.66-7.06
WA6UJS	Los Angeles	52.76-52.525
WR6ADG	Los Angeles	6.34-6.94
		7.75-7.15
		225.54-224.14
WR6ACY	Los Angeles	6.76-6.16
W6NRY	Los Angeles	222 38-224.98
		442.30-449.85
WB6KKO	Los Angeles	222.70-224.30
K6ZJS	Los Angeles	222.80-224.00
WR6ADL	Los Angeles	223.02-224.62
WR6ABJ	Los Angeles	223.14-224.74
WB6MYH	Los Angeles	223.30-224.90
W6FHF	Los Angeles	443.15-448.60
WA6NIU	Los Angeles	443.25-448.20
WA6ZOD	Monterey	6.37-6.97
		449.70-444.70
WB6ZRR	Nouato	6.40-7.51
WB6NOJ	Oakland	6.28-6.88
WB6ADP	Orange Co.	53.38-53.72
WB6VTM	Orange Co.	222.30-223.90
WR6ABO	Palos Verdes T1.8	223.34-224.94
WR6ACH	Paradise	7.99-7.39
WR6ACO	Pine Cove	7.75-7.15
WR6AEF	Pomona Valley	6.13-6.73
WR6ADU	Sacramento	6.19-6.79
WR6AEN	Sacramento	6.31-6.91
WR6AEI	Sacramento Valley	7.87-7.27
WA6ZQH	Sacramento Valley	7.78-7.18
W6NWG	San Diego	6.13-6.73
		444.30-449.425
WR6ACS	San Francisco	6.10-6.70
		448.25-443.25
WR6AEA	San Francisco Bay	6.25-6.85
WR6ADY	San Francisco Bay	6.25-6.85
WR6ABG	San Francisco Bay	7.93-7.33
WR6AOZ	San Francisco Bay	6.25-6.85
WB6CJR	Santa Clara	449.80-444.80
WR6AEB	Santa Maria	6.34-6.94
WR6ABR	Temple City (RACES)	7.72-7.12
WR6AFC	Thousand Oaks	6.25-6.85
WB6OPG	Tulare	6.16-6.76
		6.28-6.88
WR6AEY		6.34-6.94

COLORADO

WRØADN	Canon City	6.22-6.82
WAØVTV	Colorado Springs	6.16-6.76
		443.80-448.80
WBØKJA	Colorado Springs	7.66-7.06
WR8AOS	Denver	7.09-7.69
WR0ABM	Denver (RACES)	6.82-7.30
WRØACL	Denver	6.28-6.88
		6.04-6.64
WRØADX	Denver	444.70-449.70
WRØABN	Durango	6.34-6.94
WØPXZ	Grand Junction	6.14-7.94
WRBACY	Grand Junction	6.34-6.94
WRBADO	Greeley	6.25-6.85
		444.85-449.85
WR0ACR	Woodland Park	7.88-6.76
		7.94-6.88

CONNECTICUT

WR1AAO	Canton	7.96-7.36
		223.30-224.90
WR1ACY	Glastonbury	5.47-7.09
		52.72-52.42
		7.69-7.09
WR1ADK	Hartford	6.04-6.64
		443.10-448.10
WR1ADM	Naugatuck	7.78-7.18
		444.20-449.20
		22.86-24.46
W1WHZ	Norwalk	7.99-7.39
WR1ADN	New Fairfield	7.72-7.12
WR1ADL	Torrington	6.25-6.85
		443.15-448.15
WR1ADJ	Vernon	6.19-6.79
		443.30-448.30
		222.78-224.38

DELAWARE

WR3ABS	Delmar	6.22-6.82
WR4	Dover	6.19-6.79
WR3ABA	Wilmington	6.13-6.73

FLORIDA

WR4ABZ	Ft. Walton Beach T1.8	6.19-6.79
		6.34-6.79
WR4AES	Ft. Myers	6.19-6.79
WB4KBG	Melbourne	6.25-6.85
WR4AFI	Merritt Island	6.28-6.88
		6.34-6.88
WR4AFO	Orlando	6.16-6.76
		6.34-6.76
WR4AEO	Orlando	7.78-7.18
WR4AER	Orlando	7.12-7.72
WR4ADL	Pensacola	6.22-6.82
		6.07-6.67
WR4AFW	Pensacola	6.01-6.61
WB4HAE	Tampa	6.16-6.76
		6.34-6.76

GEORGIA

WR4ABJ	Athens	6.13-6.73
K4DVJ	Dallas	6.25-6.85
WR4ABO	Mableton	6.13-6.73
		223.34-224.94
WR4AHB	Royston	6.19-6.79
WR4AFD	Warner Robins	6.25-6.85

HAWAII

WR6	Hilo	6.16-6.76
KH6EQF	Honolulu	6.28-6.88
KH6EQL	Waialva	6.20-6.80

IDAHO

WR7ABG	Deer Point	6.34-6.94
WR7ACQ	Driggs	6.34-6.94
WR7ACK	Twin Falls	6.16-6.76

ILLINOIS

WA9ZPT	Addison	6.31-6.91
WR9ACA	Alton	6.16-6.76
WR9ACB	Alton	6.19-6.79
WR9ACE	Aurora	7.40-7.81
WA9WVA	Batavia	6.04-6.58
		7.66-6.58
WA9GCK	Bloomington	6.22-6.82
WR9ADF	Bloomington	6.19-6.79
WR9ADE	Bloomington	6.22-6.94
WR9ABB	Chicago	448.6-443.6
		223.34-224.94
		1250.00-1289.00
WR9ACC	Chicago	6.10-6.85
WR9AAF	Chicago	6.34-6.94
WR9ABC	Chicago	6.37-6.97
WR9ACL	Chicago	7.00-7.60
WR9ACH	Chicago	7.09-7.69
WR9ACO	Chicago	7.12-7.72
WR9ABZ	Chicago	7.15-7.75
		7.45-7.75
		7.50-7.75
WB9IEZ	Chicago	7.87-7.27
WB9KCO	Chicago	448.25-443.25
WB9ADT	Chicago	448.30-443.30
WA8TDR/9	Chicago	449.00-444.00
WR9ADC	Chicago	449.85-447.85
W9MJL/9	Danville	6.28-6.88
WR9ADG	Dixon	6.37-6.97
W89SGJ	Flanagan	6.10-6.94
WR9ADH	Genoa	6.13-6.73
WR9ACS	Jacksonville	6.16-6.76
WR9AA	Joliet	6.28-6.987
		6.22-6.82
W9AZ	Kankakee	6.34-6.94
WB9AEU	Oaklawn	447.30-442.30
WB9JCL	Springfield	6.28-6.88
WR9ABH	Western Springs	223.30-224.90

MORE NEXT MONTH

Send any and all corrections, updates or new listings to 73 Magazine, Peterborough NH 03458.

Social Events - Cont'd From p.7

AURORA IL SEPT. 22

Fox River Radio League hamfest at Phillips Park, Aurora. Picnic, zoo, gardens, whole family, prizes. Talk in 146.94 and 52. Reg $1 to WB9HYH, 1888D Carnation Ct. Aurora IL 60506.

NASHVILLE SEPT. 1

Music City Hamfest at the National Guard Armory on Sidco Drive in Nashville TN. Dinner, prizes. Sponsored by the Nashville Amateur Radio Club.

EL PASO TX OCT 12-13

Hamfest and swapmeet – seminars, prizes, flea market. Info: WB5CMB, 7772 Gran Quivira, El Paso TX 79904.

WICHITA KS SEPT. 8

The Wichita Amateur Radio Club hamfest is Sept. 8th – no info on location. Write Secretary Agnes Nibarger, 5450 Sullivan Ct, Wichita KS 67204.

MARION IND SEPT. 29

Grant County Amateur Radio Club annual Hamfest at the 4H Fairgrounds in Marion. $1 advance reg to W9EBN, Box 815, Marion IND 46952. Flea market, prizes, Bingo, camping, tech sessions, talk in 94 and 19/79.

MENA ARKANSAS SEPT. 77-8

Queen Wilhelmina Hamfest at Queen Wilhelmina State Park on Rich Mountain in Mena, Ark., Sat–Sun Sept 7-8.

GREYSLAKE IL SEPT. 14-15

Radio Expo '74 – flea market, camping, tech seminars and movies, food services, exhibits, at Lake County Fair Grounds, Rts. 45 and 120, Greyslake. $1.50 advanced reg to Radio Expo, Box 1014, Arlington Hts, IL 60006..

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

From Margate, Florida WB4OSN says, "Openings have been throughout the entire country. About the only area that has not been heard here is the Dakotas and Idaho. I had some real nice contacts with K7ZOK and a ragchew for over an hour with K7CIN. . .all signals were 5–9 plus all the time.

"The highlight of the month was: A response to a CQ on 50.075 (A1) by TG9KJ. Luis had a 559 signal here. He runs 10 watts into a 5-element Yagi. Luis is planning to have a Swan 250 on the air shortly. . .so be sure to listen for him. He made several more contacts and I believe that he made enough to apply for SMIRK membership.

"I had a QSO with Erik TI2NA on 10 meters. Erik is running a beacon on 50.095 from San Jose. He is also running a Swan 250. When we signed he was going outside to raise his 5-element Yagi to 50 feet. Erik has a rig at his office as well as at home so he should be a little more active. He plans to run the beacon continuously."

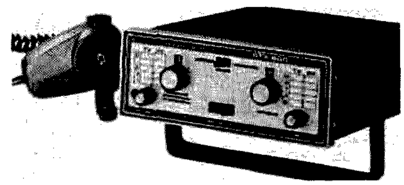
From Dallas, Perry WB5IKU says he has worked everything from KP4AHQ to VE3ONT since getting back on 6 after an absence of several years. . .says he has heard XE and TI stations but unable to work them through the pile up. South American TV also mentioned as being seen on almost a daily basis.

Ray K5ZMS/5 says SMIRK is up to 370 members in 41 states and 10 countries and recounts contacts and openings far too numerous to mention. Ray says you must call TI2NA on 50.150 due to the transmitter blocking the receiver(?)

Having worked both the June contest and field day using low power (about 10 watts output) I would like to make a few comments which should help the average station make more contacts and improve the lot of the increasing number of stations running low power. First and foremost. . .turn the knob. . .it is absolutely impossible for every station in the country to park on 50.110 and expect to make a reasonable quality contact. You may not hear anyone exactly on the same frequency but the station(s) on the other end may be hearing a dozen or more. Increase your ODDS by getting off 50.110. Probably the second most detrimental habit is repeating the called stations callsign over and over again. HE knows who HE is. . .he wants to know who YOU are. In the same vein, I am sure each of you has heard stations calling CQ for several minutes at a time boring those listening to the point that they look elsewhere for a contact. Keep "dupe" sheets, especially if you are involved in a multiop operation. Finally, check out your equipment before starting. Make sure it is working properly and is unlikely to malfunction in the middle of the operating period. Also make sure your rig SOUNDS good, without hum, carrier, reverb and the like.

WAØABI

NEW PRODUCTS



GENAVE GTX-600
A Brand New 6 Meter Transceiver

As the two meter FM band fills up in most urban areas, repeater groups have been looking around for other bands to populate. Some have gone the 220MHz route – particularly now that Clegg has been delivering 220 repeaters – while others have been going to six meters.

The fact is that six has a whole lot to recommend it. The ground wave coverage on six is a lot better than two meters, with many repeater groups finding it up to half again as good in distance. Then there is the matter of band openings – they do happen on 2m, of course, but not with the regularity found on 6m. There is something wonderful about driving along in the car working one station after another over a 1500 mile path. From New Hampshire via the several New Hampshire 6m repeaters, contacts with Florida and the other southern states are very common.

Now, to get to the Genave rig – it is small enough to easily fit in the car – runs all the power you'll need for most applications – not that you can't add on one of those TPL amplifiers. But 30 watts is adequate. It has ten crystal controlled channels and comes with the national simplex channel all set to go – 52.525 MHz.

Genave, which makes a lot of stuff for aircraft, has put the special circuits into the 600 to keep down harmonic emission (so you won't be wiping out television for miles around as you drive).

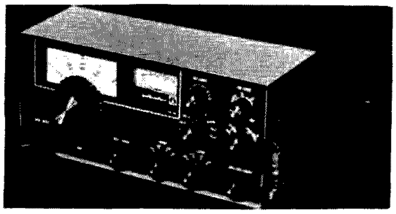
Not bad for $309.95, eh? For details write: *Genave, 4141 Kingman Drive, Indianapolis IN 46226.*

MARK II

Hallicrafters introduces Mark II version of FPM-300 "Safari."

A new and improved version of its high performance, precision-built FPM-300 'Safari" SSB/CW amateur transceiver, the Mark II, is being introduced by the Hallicrafters Division of Wilcox Electric, Inc., Rolling Meadows, Illinois.

The new FPM-300 Mark II, like its predecessor, provides complete coverage for Single Side Band (SSB) and Continuous Wave (CW) operation



in the 80-, 40, -20-, 15-, and also 10 to 11 meter domestic and international amateur bands. Reliability and serviceability has been further stressed in the Mark II.

The Hallicrafters transceiver is a hybrid system using the most desirable features of solid state and tube circuitry in its design. It's a complete desk-top or under-the-dash/hump mounted mobile amateur radio station. The FPM-300 Mark II is intended for both domestic and international markets and has a built-in power supply for 117/234 VAC and 12 VDC power sources. Only an antenna and key or microphone are needed to place it in operation. Like the FPM-300 the low price of $625.00 has been maintained in the Mark II, according to the manufacturer.

The FPM-300 Mark II, Dimensions (HWD): 5½ x 12¾ x 10¾ inches; net weight 25 pounds. Additional data is available from Hallicrafters Division, Wilcox Electric, Inc., 600 Hicks Road, Rolling Meadows IL 60008. Phone 312-259-9600.

ANTENNA NOISE BRIDGE

The new R-X Noise Bridge by Palomar Engineers measures both resistive and reactive components of antenna impedance. The resonant frequency of an antenna as well as its feed point resistance is easily found.

The ability of the bridge to measure reactance is a useful feature not found in previously available noise bridges. The off-resonance impedance can be measured and it is easy to tell whether the resonant frequency is lower or higher than expected. This greatly simplifies tuning and matching.

The R-X Noise Bridge operates in the 1-100MHz range and measures resistance from 0-250 ohms. Price is $39.95 postpaid from *Palomar Engineers, P.O. Box 455, Escondido CA 92025.*

HALLICRAFTERS

Contrary to some irresponsible reports, Hallicrafters is not defunct but is doing quite well, thank you. Hallicrafters was purchased recently by Wilcox and is a division of Wilcox Communications Equipment, 3151 Fibreglass Road, Kansas City KS 66115.

LETTERS

AMATEUR RULES

In recognition of the invitation to write a letter to the editor abour proposed changes in amateur rules, I am hereby taking advantage thereof, by giving some views of my own.

We amateurs did well, utilizing three classes of license and it was a bunch of soreheads that wanted what everyone else (who made the effort) had in the way of operating privileges. FCC had not allowed phone operation by less than class "A" from 2050 KC/S to 28,500 KC/S. The 160 mtr band had been "appropriated" by 'Big Govt' and we could do nothing about it. So changes are made to open the previously exclusive phone bands to everyone, and lower the code requirements by adding the "Novice" class. Since Technician class must pass the same code test, they should have the privileges the Novice class have, too.

But this "cheap-skate" license and proposed doing away with code requirements completely, is the destruction of amateur radio. Every amateur ought to know the code, and be allowed to use CW anywhere in our bands. I feel the three licenses should be "Extra" class, (like the old class "A") General class (like old class "B"), and "Beginner" class but after a year, with an endorsement, it could be as General but the same as old class "C" which would make provisions for the ill, handicapped, aged and the like. Privileges should remain much the same as at present but up-grade the code test to 13 wpm and see that the horse comes first before the cart... CW gets first place as the basic mode of communicating with other methods after which require sophisticated equipment additions and give a better break in splitting frequency usage.

Perhaps all formal nets ought to be required to use a certain area of one band (the band used regularly by the net) to allow for general rag-chewing by others. In the case of separate PH/CW exams, it would place a serious burden on FCC and amateurs alike, when 2-way communication is not possible on phone in particular. "Sorry old man, I can't send CW, I don't know the code"...great. Shall we pursue the hobby by using semiphore from hilltop to hilltop? When code is no longer needed so that the commercial telegraph test (license) is no more, only then will I agree to cut code from amateur radio. Also, AM is part and parcel of SSB-SC, and cannot be deleted. This is a hobby with many beneficial side effects to others, not a business enterprise and ought to be treated as a hobby. One may like CW, another phone, with any usable quality, while I like hi-fi, and there should be no restriction on building hi-fi receiving and transmitting gear. This should include AM and FM. For the nuts who now illegally play music on the bands, how about a segment somewhere that they can go? Please don't forget the "old men" who have held a class "A" ticket for many years, for they ought to be given "extra" status where they held the top grade of license before. As a last cra...I mean suggestion, let amateurs have 1 KW for the lowest class, 2 KW for the General class, and 3 KW for "Extra." The QRM isn't caused by low power stations. What if no transmitter could be manufactured for more than 1 KW, thus making amateurs build their own hi-power??

Robert Perkins Thayer W1PBE

I read with interest your "Getting Rich" comment on the opportunity existing for "Hams" in the installing and serviceing of security devices and systems.

While I do agree with you that the opportunity certainly does exist at this time, I think you might caution your readers to check into a few things like local and state laws before hanging out the shingle.

Most cities require a business license and some cities require qualification examination. Many cities require a contractors license, an examination, and a bond and some even require a state contractors license. In spite of all this, in an area where the competition is not too severe, it is still a good idea.

There are many applications that an alert "Ham" can come up with, but before investing in the equipment for the first job, just be sure that all local ordinances are compiled with so you won't find a "Stop Work Order" hung on a half finished job.

Francis L. Fuson K7VHS
Las Vegas NV 89102

Cont'd on p.132

DX FOOTNOTES

Gus. M. Browning W4BPD
Drawer "DX"
Cordova SC 29039

The new DX season is just about upon us again, after a very poor (propagation-wise) summer. The sunspot situation is somewhat still debatable, it seems. Some say the worst is yet to come, others say "It won't be long now, etc." I guess we will just have to wait and see what happens from now on out. It seems that the real DXer, the fellow who is "in there" is still working plenty of good DX, even though conditions are a long way from being at their best. Of course, the Amstat DX workers are not bothered by the sunspot situation and there will soon be someone with an "Amstat" DXCC if they keep on plugging away. Of course, the WPX fellows always have plenty to chase. There is plenty for a DXer to do if he wants to keep busy and do a little "bookkeeping" so he will know where he stands in his various interests (I wish I had time to practice some of the stuff I preach!).

I have been asked by many people about this "country" business, such as what is a "country" and what is not a "country." Speaking for myself, personally the more there is the merrier, cut the mileage between the islands, count very state in the USA as another "country" (Russia has more countries than we do, and I don't think there is much more difference between their Soviets than there is between our states), and maybe some of the other larger countries could be cut up into two, three or more countries (provinces in Canada comes to mind, etc.). Our new Super WTW will be doing just this when we get it all organized and running, and we will count every island as another country as an example, every state in the USA, every province in Canada, Soviets in Russia (or maybe even each Oblisk), etc. We want a L-O-N-G list for the fellows to chase, something to keep them BUSY for a very long time, something that they will not catch up on for a long time. I know how some fellows feel about adding more to the country list, since they have them all right now. We want something going that cannot become "stagnated" on account of a fellow getting them all and working himself out of a job. The whole difficulty it seems is the poor choice of using the word "country" as a DX yardstick. In the English language there must be a better word that more fully describes DX, than the word country. I would like anyone who can come up with a better word to drop me a line and mention their choice to me, maybe in our small way we can get this word in circulation and start a new trend in the new DX world, and get rid of this debatable word "country" in describing our DX yardstick in the future. How about this fellows?

Jake CT2AZ, also WØJHY, is staying here with me for a while and did a lot of "listening" to the recent DXpedition to Kingman Reef (the most recent new DXCC). He gave me a blow by blow description of things as they were happening. I suppose most of you serious DXers were listening too and heard most of what was happening also. After it was all over and the boys were back on their way to Johnson Island to pick up some fuel oil and continue on to Hawaii, the story was more or less finished for that DXpedition. It seems that they had trouble first in finding Kingman Reef, and when they finally arrived at the reef sundown caught them and I suppose they pulled away from the reef area for the night (no ship Captain wants to be drifting around at night in the immediate area of a reef). Then they had the usual difficulties actually landing their equipment on the reef (it was about the size of a two-car garage, as it was described over the air), and not much above the high tide mark (I never did hear how it was during low tide. Maybe under the water?). The planned length of time for operation on the reef had to be cut due to a number of things that happened. Three of the fellows had to be back in Hawaii by a certain date so they could return to California and their jobs, it took longer to get to the reef than was planned and then they departed the reef one day before they had planned because of a sudden storm that came up. All this just proves that DXpedition plans just don't ever happen with perfect clockwork, even when the plans are made as carefully as possible. I guess just about now they are planning another assault on Kingman Reef next year (or maybe someone else later on this year). The low frequency gang is disappointed, I am sure, because the DXpedition did not get on for these fellows, due to the short stay on the reef. They did a very FB job for the length of time they were there though. The operators from the reef were: K6AHV, WB6OOL, W6OAT and WA9UCE. The call from the reef was KP6KR. I am sure many thousands hope they (or seomeone else) will return and stay much longer so that everyone will have a chance to add this one to their country worked list. You know when you are right up there at the DXCC Honor Roll level you just cannot miss even one new country or maybe you will be bumped from the list. Let's hope another, longer stay at Kingman Reef is right now in the planning stages by someone – and good luck to them.

I keep on receiving QSLs for various DXpeditions, and bootleg DX calls, addressed like this: W4BPD, QSL MGR., for so and so, etc. I again want to tell everyone, that I am not, never have been or will be a QSL manager for anyone, not even myself. QSLing to me is harder work than digging a ditch or cleaning up a WC. Don't let anyone, at anytime tell you that W4BPD is their QSL manager, because they are talking through their hat. I don't have time to answer these QSLs that are sent to me and they usually end up in my trash basket, unless a SASE is sent along with them. Then I just write on the card – not me! – and put it in the SASE and send it back to them. So I again say, don't send me cards for someone else! I have a heck of a time just answering those sent to me for my DXpeditions or home station.

A new station is active in Cambodia – XU1DX, has been worked on the low end of the 20m SSB band (around 14203) around 0033 GMT, probably active at other times too. DL6ZZ has worked W1MV 949 times (the 950th was an eye-ball QSO). Old MP4B has a new prefix – A9 (old MP4B is Bahrain Island in the Persian Gulf). ZA3ZP was worked by W9KM, he said to QSL via DJ6QT – my guess is another pirate, but his choice of QSL manager is pretty good if he is – maybe I am wrong, let's hope it is OK. Another new prefix is A6 – for the United Arab Emirates (something like the Old Trucial Omans I guess), but I understand that all the Old Trucial Oman states did not "join-up" with the new "Emirates." This may, possibly, make another change over there in the DXCC country situation. What do the few old Trucial States count for right now? And this brings up those other "State Like" places in The Hadhramaut (more or less North of Aden). They told me when I was over there that each one had its own Shiek and set of laws and the whole area was governed by each of these Shieks and no one else. Now here are about seven possible new ones (but, who will let anyone in to do the operating, maybe getting their throat cut in the deal! hi). Then there is that little known "neutral zone" at the Khyber Pass (I once went through the Khyber Pass). But, trying to find a place in those mountains to set up the rig would be a real problem, I can tell you!

A month or so ago FR7ZL/T was active from Tromelin Island (in the eastern part of the Indian Ocean, north of Reunion Island). The operator was Guy, who was having a heck of a time handling it all. He finally gave up and just pulled the switch. A few fellows suggested to me that he could have certainly used a "MC" or at least someone to make up a list for him to work by – or something!

It's nice to sit back over here and suggest such things, but you have to remember that some fellows don't want help from anyone. This is a good attitude for a DX station to have if he can handle the situation. I would suppose that since he was inside the USA portion of the band that he was stuck with transceive operation only and when you can only use transceive (working the fellows on your own frequency), then you do have a problem. Especially if English is a strange language to you. Also sometimes, on top of this, certain DX stations couldn't care less whether or not they work USA stations. In other words you need them but they don't need you! This is bad for the fellows back here that need Tromelin Island for a new country. Then there still exists the problem of getting the QSL card if you are lucky enough to work that elusive one. I guess that's why most DXers would much rather work a DXpedition who has a good QSL manager to handle his cards. It doesn't do too much good to work a "new one" and never get a QSL card.

I suppose many of you have heard of the untimely death of Hersh W5ZD. He was a DXer who knew his way around when it came to DXing. He had many, many friends and was always right in there handling some DX net or acting as a MC for a DX station. He was always glad to help anyone get a "new one" if possible and he was always loud, even overseas. He will be sadly missed in the DX world by all of us.

Another very well known DXer passed away a few months ago, Van WA9HUZ. He was very interested in DXing, especially in working the rare ones on 40m. His signals on 40m were always very good, I suppose he had a FB location or antenna or both for 40m. I so well remember that when I worked VAn from some rare spot when I was on 20m, his first question was, "When on 40m, Gus?" and when I got on 40m he was usually the first one I worked. A good DXer, many of us will miss his fine DX work.

WTW Contest

That's right, we are going to have a DX contest. Our contest will be different. The contest will run 48 hours (non-stop) starting Saturday morning (GMT), which is 7PM EST. Friday night on the east coast. Starting time is 0001GMT, October 19, 1974, and it ends at 2359GMT Sunday night October 20, 1974. The scoring system in our contest is very simple: work as many DX stations as possible, each contact will count as 10 points (any band, any mode, no QSL required – your word is OK with us - but we want to see a copy of your log. And, if, you work too many stations that no one else has worked we will be very suspicious, and we may publish the list of those certain "suspicious contacts" and everyone will know about you! Be careful Ole Buddy, please. The exchange with each station should be his call, contact number and report combined, such as 001579 (for your first CW contact) or if it's phone (SSB, SSTV, etc.) the number exchanged could be something like this: 00158 for the first contact (contact number 001-signal report 5/8), and that's all. Next we want his "handle" on each exchange (only QSO number, signal report, combined, and handle is total exchange). Your multiplier (each country) is 10 for each country. Any place that any national society or association or league calls a "country" is what we will call a country. You might check this part very carefully, because there is a good many places that others (than ARRL) call a country – such as European Turkey, Asiatic Turkey (by WAE?). The DUF counts the island of Ste. Marie off the coast of northeast Malagasy Republic. Also, don't overlook that our WTW list includes such spots as the Isle of Europa and Juan de Nova as separate countries. Also, we count Tristian da Cunha and Gough Island as separate countries. We will count any island that is over 100 miles from its nearest neighbor as a new one. These will give you something to more or less go by in doing your calculating on your scores in our WTW DX Contest. Just call CQWTW if you are one of these CQ callers! Please broadcast this contest to everyone you can, we would like for it to be a good, active one.

Since it is being announced rather late in the season we will need all the publicity we can get. We are going to have a WTW Contest every year from now on. So how about helping us get started off with a good loud "bang?" All scores should be received by me no later than Christmas day, December 25, 1974, and all the scores will be published in 73 Magazine a month or so after that.

I promise all of you that next month I will have a list (up to date) of our WTW DX areas (forget the word country). And, also a complete (as far as possible) list of our all new Super WTW DX areas. I will also be printing up these lists for you to use in your score keeping and other records. You will be able to use them when you send your WTW or Super WTW information to us. You keep one copy for your records and we keep one to add to when you submit new ones to us. You can start working on your scores right now because the regular WTW scores are for all contacts after 0001 GMT, May 1, 1966 and the Super WTW all contacts after 0001 GMT, January 1, 1960. Dig up those DX cards that DXCC will not accept as a new country (it is possible we will count them). We want you to be happy and we want you to have a big total!

Anytime any of you write me please be sure to send a SASE if you expect a reply to your inquiry. I try to answer all letters received, but sometimes it may take a little while to do this.

Lots of fun fellows messing around with these little ICs. Better try your luck with them and try to learn what they are all about and what they can do. Try making a few "printed circuits" fellows. They are a lot of fun and if you draw them out right, mount the parts in the right holes and solder correctly, the "gadget" will work the first time you apply voltage.

Anytime in the line of DX, DX ideas, DX working, sunspot stuff, DX antennas, DXpedition information, etc., is always needed here. Please remember us when you come across anythingthat you think would be of general interest to other DXers. This is your column and I want it to please as many of you as possible.

That's it for this month.

W4BPD

QSL CONTEST

The QSL winner this month is Eugene Sedberry W8JUL with a beautiful full color QSL card. On the back it says, "One of my bird friends and I discuss the weather, DX, what's for dinner and other subjects of serious mutual interest at Iron County QTH." A one-year subscription extension is the prize. How about your QSL? Is it different enough to win the monthly QSL contest? If not, why not? Your QSL expresses YOU! Are *you* special?

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Bet you caught on by now that I am not trying to tell you how to put together your own remotely controlled amateur station. That would be far beyond the scope of this column. Rather, we are discussing the reasons that many Southern California FMers are still building these complex systems and installing them on our various mountain tops. To that end I spent a Sunday visiting with three of the most "together" hams I have ever met. If Skip, Mark and Gary are indicative of the caliber of amateur that are known as "Remote People," then our hobby is in pretty good shape.

On a number of occasions I have been asked by those unfamiliar with the remote scene if all these private systems were not using up valuable 450 repeater spectrum. About two years ago I might have felt that way, but after learning of the many technological developments that can be directly attributed to the Remote People I would be hard put to oppose what they are trying to accomplish. All I can say is that you have to experience what one of these systems can do to really appreciate it. In an earlier "Looking West," I said that the rest of the country grew up repeater oriented on 450 while we here in California grew up remote oriented. Today, the remote is as much a part of the FM scene in this part of the country as a good beam antenna is to the avid DXer. It's that simple and there seems to be little argument on this point within our amateur community. From time to time some dissent on certain things may arise between individuals, but they are usually settled by those involved.

Back to the interview. I had received a qualified yes to my question about remotes causing friction between amateurs from time to time. Skip Hansen WB6YMH continued, "You must remember that simplex, remotes and the technical type of people that inhabit them were here long before the first ham type transceiver ever appeared on the market. In those days, if you operated two meters you knew that FM existed, but if you operated mainly on the low bands you knew only that two meters existed. To be an FMer back then you also had to be a technician capable of converting commercial equipment to two meters, correlate your own crystals and things like that. Just about everyone ran commercial equipment and most of the activity was centered around .94. Well, suppose I am listening to .94 through the remote and I hear a simplex QSO up in Santa Barbara, but the signals only read one microvolt. Now a buddy out in the San Fernando Valley comes on running an HT. If Santa Barbara is reading only one microvolt to me, then I can assume my signal into that area will be comparable so I go ahead and answer the Valley station knowing that I won't be bothering that local Santa Barbara QSO. Well that's the way it was for many years with remotes and simplex sharing .94 with little problem. Then came the Two Meter FM fad with everyone running out to buy those cute little boxes all factory equipped with 146.94 simplex.

Let's put our hypothetical Joe Ham South of the San Fernando Valley in Santa Monica. Joe has just put out 300 big ones for his new toy and wants to see if it works. Eager to talk to someone he calls CQ or something like that, not realizing that he is now capturing the remote receiver and wiping out the Valley station. There is a mountain range running between Santa Monica and the Valley, so Joe could not hear the Valley HT. Our new FMer has made the same mistake that most newcomers to FM make. He has failed to listen first and learn the operating procedure for this band and mode. Sort of the same thing that you hear on repeaters these days when someone new shows up and there is the question of what repeater he is on. Well, I let him know what is happening and ask him to stand by until I am finished. In the beginning this worked, but as more of the appliance type operation began to appear on two the situation grew intollerable. Some confrontations did develop and eventually all but the most die-hard remote owner moved his system off 94. 46 was officially established as the area Remote Base Intercom Channel and that's the way it stands today."

"Skip, do you think that the current influx of 'Ham Type' 450 radios will cause a change in this area's 450 operating perameters? "I sincerely doubt it. Not with the long, well established operating perameters that exist on 450. This is the band where all special interest groups have a place and most of us get along pretty well. Basically we tend to respect one another as it's to the best interest of all concerned. To make an outsider believe that a repeater sub-band on 450 in this area is a totally unlivable handicap must seem absurd, but you know it's a fact of life.

A couple of years ago when 18803 was first being drawn up, an experiment was performed to determine just how much activity this area really had on 450. A particular Saturday evening was chosen and word was passed to all interested parties to transmit at a given hour. Someone was up on a mountain with a spectrum analyser and scope camera to record the results. The picture showed relative inactivity above and below the band with one solid wall of rf from 420 to 450 sitting at the 70dB mark. I was told that this picture was officially submitted to the FCC and rejected by them as not being believable. (ed note: If any of you have a copy of this picture and would not mind parting with it, I would be happy to print it in a future column. I have heard 450 and I believe.) But Bill, you yourself have heard how much 450 acitivity there is!"

"Can you see remote systems taking an active part in the development of 220MHz Skip?" I don't think so; the kind of interest that remote people have doesn't lie in that direction. Southern California is the only area I know of with a large number of remotes and the people on these systems are for the most part technically oriented not appliance operators. Most of us are really fed up with the type of operation that is two meters today. That's the reason you don't find them on .94 or many of the other two meter channels they used to operate. Unfortunately, with the lack of easily convertable equipment of the commercial variety for 220 along with the appliance type operation that is already developing, I don't think you will see many remote systems equipping themselves for that band. Honestly, what reason would a remote owner have to equip for a band on which he has nothing in common with the rest of its users? 220 is already developing into another two meters."

Are remote owners and remote people different from the rest of the amateur community? If the GFRN people are typical, then the answer is yes. First and most important, they are among that breed of amateurs, the builder-experimenters who are not afraid to get their hands dirty to make a dream into a reality. By today's "cute little box" standards, a remote is not a pretty looking thing. What radio rack is? To its builder it is a thing of beauty to behold and something to be proud of. Skip commented that in a way it is the fulfillment of an

ego trip. Well, call it what you like, the sophisticated systems we call remotes and the people that build them are today's pioneers. Docket 18803 almost spelled an end to the remote, but thankfully restrictions are now being eased so that development of sophisticated systems can continue. We sincerely hope that this trend on the part of the FCC will continue as they too recognize the contribution that these systems are capable of making to the overall picture of amateur radio.

So, if owning a Remotely Controlled Amateur Radio Station is an ego trip, and if it takes that kind of ego to lead to further experimentation and technological development then we in the amateur radio community need a lot more of that ego. No, the remotes and private systems that abound on 450 in this area are not wasteing valuable repeater spectrum. Rather they may hold the key to the future survival and growth of amateur radio. My thanks to the members of the Grand Funk Radio Network for making this article possible.

AMSAT NEWS

OSCAR 6

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Dayton OH 45429

Launch of A-O-B (AMSAT-OSCAR-7) is now scheduled for early October 1974. Launch date is determined by the readiness of OSCAR-7 and by the availability of NASA launch platforms. By the looks of things right now October is a pretty promising date.

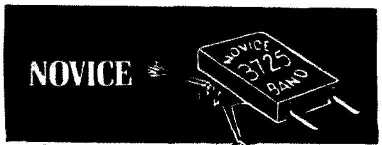
AMSAT-OSCAR-7 is the first amateur satellite to be formally licensed as a space station in the Amateur Satellite Service. The previous six OSCAR satellites were all licensed under the authority of regular club station licenses (W6EE and WA3NDS) by letters authorizing their operation rather than by issuance of special licenses.

There has been a suggestion made by OSCAR-6 users to separate the voice and CW activity going through the satellite. Although the suggestion has been tabled by The Amateur Satellite Service Council for later discussion, I personally believe the proposal would greatly enhance the effectiveness of satellite communications. Comments on this subject or comments and suggestions in general are welcomed by AMSAT. Send to, AMSAT, P.O. Box 27, Washington, DC 20044.

Orbital Information

Orbit	Date (Sept)	Time (GMT)	Longitude of Eq. Crossing °W
8582	1	0032.9	56.6
8595	2	0127.9	70.3
8607	3	0027.8	55.3
8620	4	0122.7	69.0
8632	5	0022.7	54.0
8645	6	0117.6	67.7
8657	7	0017.5	52.7
8670	8	0112.5	66.4
8682	9	0012.4	51.4
8695	10	0107.3	65.2
8707	11	0007.3	50.1
8720	12	0102.2	63.9
8732	13	0002.1	48.9
8745	14	0057.0	62.6
8758	15	0152.0	76.3
8770	16	0051.9	61.3
8783	17	0146.8	75.0
8795	18	0046.8	60.0
8808	19	0141.7	73.8
8820	20	0041.6	58.7
8833	21	0136.6	72.5
8845	22	0036.5	57.5
8858	23	0131.4	71.2
8870	24	0031.4	56.2
8883	25	0126.3	69.9
8895	26	0026.2	54.9
8908	27	0121.2	68.6
8920	28	0021.1	53.6
8933	29	0116 0	67.4
8945	30	0016.0	52.3

WB8LBP



Don Ferris WB8JYX
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Are you about to receive your novice ticket through the mail? Have you just passed your novice test and already received your ticket? Well don't get up tight at the thought of your first attempt to make a contact on the novice bands. With a little preparation as to precedures and equipment you can start your new venture into amateur radio with confidence and be assured that when other amateurs you have contacted talk about the A1 operators they have worked, your call will be among the top ones mentioned.

First of all is equipment. Even a newcomer to amateur radio should have certain basic equipment. If finances are not a problem then my advise is to purchase the best transceiver you can as a novice. Some well known and proven transceivers are; Heathkit HW-100, HW-101, SB-100, SB-101, SB-102. . . Yaesu FTDX 560, FTDX 570, FT101, FT401. . . SWAN 260, 270, 350, 500, 500cx. . .DRAKE TR3, TR4, TR4c. . . HALLICRAFTERS FPM 300. . . The overall purchase price will be somewhere between $225 and $750. The reason you will be further ahead by buying a good transceiver in the start are many. First of all your contacts per call ratio will be much higher with a good transceiver. Second the quality of most transceivers will give you an excellent receiver along with a transmitter which will be able to be reduced in power to 75W input and when you get your general class license or higher you can just raise the power level up to meet your needs. Most transceivers run between 180–550W input. Voltage times current gives you power input. Third is the ease of operation which a transceiver gives you, VFO built in, and other options you might not get with separate transmitter and receiver. Fourth and last is the fact that you will probably get more for your transceiver when you get ready to sell it than you could for separate transmitter and receiver.

Now if you are like most and can't afford a good transceiver you can still buy a good receiver and transmitter with excellent results in obtaining contacts on the air. One advantage to separate transmitter and receiver is you can transmit one frequency and receive on another. You should buy the best receiver you can afford then use your extra finances for your antenna, transmitter, SWR bridge, and TR switch. A good receiver should include a crystal calibrator at least 100kHz, dial readout to 5kHz, and at least 10 through 80m in 5 separate bands, sensitivity of .5mV or less and stability. Price range will be between $70 and $600. Novice transmitters are easy to find and most work quite well. Some of the better ones are: Heathkit DX 40, DX 60, DX 60A, DX 60B. . . Drake 2nt. . . Ten-Tec series and Eico. . . Prices range from $10 to $100. . . Many enjoyable hours can be had using crystal control in the novice bands but if you want more contacts per call you will want a VFO (variable frequency oscillator). Priced from $10 to $70.

A useful and time saving piece of equipment you should have is an SWR bridge (standing wave bridge). This device lets you know if your antenna is resonant at the operating frequency you are at and so will give you an idea of how much power you are putting out into your feedline from knowing where your bridge meter usually

reads. If you use separate transmitter and receiver you will need some way of switching from your transmitter to your receiver on one antenna. This is called a TR switch. You can find many kinds at your local radio store or homebrew one yourself from the ARRL Handbook.

Good receivers, transmitters and procedures are a must but even with all these you will not make many good contacts without a reliable, resonant antenna system. Commercially, many are available for multiband operations from 10–80m. You have your choice of a Hustler 4B TV... HY-GAIN 18 AVt WB... and Swan or Gotham... From experience and ease of assembly I find the Hustler 4BTV with or without the 75-s resonator for 80m preferable over the others. Prices between $25 and $90. If you would rather try your hand at homebrewing an antenna there are many ways you can go. My advise is to get hold of the ARRL antenna book or ARRL Handbook and go by their specifications. For simplicity and all around effectiveness you can make a dipole for each band you would like to use.

Procedures are not hard to learn if you are interested in becoming a good amateur operator in every sense of the word. First of all practice your code both sending and receiving every chance you get. You can never get too proficient at CW. Don't be afraid to take criticism of your sending and learn from those criticisms. Go into each session of code practice with the attitude that it's fun and you are working towards a goal of a permanent amateur license of general or higher and don't get frustrated by mild setbacks in speed. Don't be afraid of working other than novices on the air. Your speed will zoom if you make it a practice to work those a little faster than yourself.

For the first time on the air, here are a few pointers that may make your hand less jittery and your stomach less fluttery. Be organized, give yourself room and be comfortable. Use a dummy load to pretune your transmitter then put on your antenna for the band you are about to work. Now take out a clean sheet of unused paper and have a couple sharp pencils handy besides the one you are using. Listen on the band you are about to use to see if there are any other amateurs calling CQ. If there are then by all means answer a CQ before you send one. The other amateur will or should call CQ CQ CQ de wN8??? wN8??? CQ CQ CQ de wN8??? wN8??? K. While he is sending write down his call and put in a crystal as close to his frequency as you can. (Make sure no one can be heard on your crystal frequency.) When he sends K you turn your transmitter to transmit and send wN8??? wN8??? de wN8??? (your call) ar of you are within 2kHz of his frequency. If you are further than that give him a longer call like wN8??? wN8??? wN8??? wN8??? de wN8xxx wN8xxx ar. Listen to see if you hear him calling your call then you can sit back and copy all that he sends as best you can. Probably something like: wN8xxx wN8xxx de wN8??? wN8??? tnx for the call om bt (-...-— ur rst RST is 579 579 bt qth is Detroit, Mich Detroit, Mich -...- name is bill bill hw? wN8xxx de wn8??? K Now it's your turn wN8??? de wn8xxx if you copied all his sending or at least got his name, qth and your rst send one R. If you missed anything then start right out by asking for a repeat of what you missed. Don't be ashamed to ask for a repeat of what you missed or for QRS, please send than how fast you can copy. If you got everything sent you can send the R tnx fer rprt bill -...- ur rst is 579 579 -...- my name is don don -...- qth is hazel park, Mich hazel park, Mich -...- wx is cloudy and cool abt 65 -...- HW? wn8??? de wn8xxx K If he got all you sent he should send R then continue the QSO. If you have a hard time thinking of what to say and send at the same time, sending from prewritten text is permissable to get you started. A few sample phrases follow: Wx is cool but should clear up by tomorrow; my rig is a drake 2 nt and rcvr a hq 110ac; I work at chevrolet in the die room; I work afternoons; I go to school at beecher high school; I got my novice ticket on may 14, 1974; How many countries have you worked? How long have you been a ham? You are my first contact as a ham, etc. etc., etc.

Make some of your own and use them until you get the hang of thinking and sending in unison, its worth the effort and it won't take you long. If you would like to end the QSO on your last transmission you will just say mni tnx fer fb QSO es 73 hpe cul ...-.- SKwN8??? de wN8xxx K listen for his final and ther was your first contact as an amateur. Wasn't hard was it?

Don't expect everyone you call to answer you and don't expect an answer every time you call CQ. If you got one you would be the first one ever to do so in the history of amateur radio. A nice percentage is about 30% as a novice if you use crystal control and 60% with a vfo. Get into as many contests as you can, they will help your code speed faster than any other way. The novice round-up is in February, the ss in November and any others you see listed in QST magazine. Send to the ARRL for all of their operating aids. RST report, countries list, and others.

I wish you many enjoyable years in amateur radio and many enjoyable hours now as a novice, just remember:

1. A few short cqs are better than one long one.
2. Don't expect to run your letters and words together and make contacts.
3. Log your air time immediately or you'll forget.
4. Keep your time in GMT so anyone you work will know exactly the day and time of your QSO.
5. Tune up on a dummy load.
6. Be honest with your rst reports so the other ham you work will know how you are hearing him.
7. Don't let amateur radio occupy so much of your time that you forget the world is still around you.
8. Don't be afraid to join clubs, send QSL cards and work contests, they will make you enjoy your hobby that much more.
9. Use common sense and give the other guy the benefit of the doubt and you'll get along not only in amateur radio but life as well.

...WB8JYX

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you are interested, send *73* your name, address and phone number. Don't be bashful – remember, it's always easier when you have someone to give you that added bit of confidence.

73 would appreciate amateurs and clubs looking this list over and helping whoever they can. Do you remember when you needed help?

The following need some help – can *you* spare some time? Clubs in particular take note.

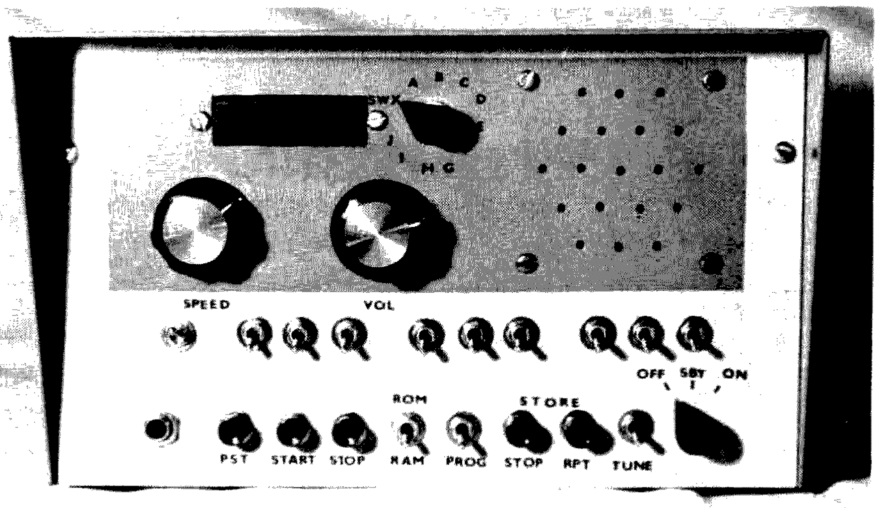
John Bernay, 306 Bower, Hot Springs AR 71901 (ph 501-624-3198)

Arthur Avillo, 5848 Garden Avenue Sp 49, Marysville CA 95401.

(Art is 62 yrs old and trying for Novice – asked SCM for help, got none – anyone out there to help him?)

If you need help, let 73 know – don't be bashful – the readers are solid gold and are anxious to help you. If you would like to help, let 73 know about that plus your area of expertise, if any, so we can list you for either general help or as a technical advisor.

Emil Hrivnak W3HPX
147 Penn Lear Drive
Monroeville PA 15146



MOSKEY

A PROGRAMMABLE IAMIC CMOS KEYER

Part 1

The long desire to have a programmable CW keyer has been nourished many times by the recent articles in ham radio magazines. I have not been entirely satisfied with any of the circuits because they contained only Read Only Memories (ROM) which once programmed could not easily be changed, or those that did contain programmable memories were limited in storage capacity and not easily programmed. I decided to build a programmable keyer using read/write Random Access Memories (RAM) with a large storage capacity, 50 to 60 words, and make provisions for a ROM to be installed in it too, so I wouldn't have to reprogram frequent used phrases. After looking at all the keyer articles I could find that were published over the last few years, I defined the requirements for my ideal keyer.

The keyer I constructed in the spring of 1972 satisfied the following requirements:

1. The basic keyer should be an Iambic type with dot and dash memories for use with a squeeze paddle.
2. Letter and word spacing timing should be built into the keyer.
3. The keyer should contain a RAM programmable from the paddle.
4. Provisions for installing a ROM should be made so that permanent sequences could be stored in the keyer.
5. When sending from memory, either RAM or ROM, the stored sequence should be interruptable from the paddle at the end of a word space so that the sequence could be modified. This would allow the insertion of DX or FD, etc., into the stored sequence of CQ CQ CQ DE W1GCA giving CQ DX CQ DX CQ DX or CQ FD CQ FD CQ FD, or would allow the insertion of a signal report or station call sign into a transmission being sent from memory.When no further characters have been entered from the key, control would return back to memory.
6. The address counters for the RAM/ROM should be programmable from the front panel, via switches, so that different sequences stored in memory would be easily accessible.
7. When programming the keyer, it should enter an idling mode after storing a

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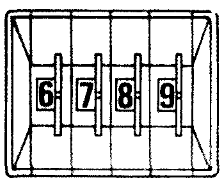

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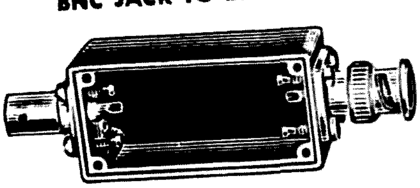

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word space in memory if no further dots or dashes have been entered from the key. This would prevent the memory from being needlessly filled with spaces when pausing at the end of a word.

8. A free running clock would be used and would have to be at a rate much faster than an element time unit (an element time unit defined as the period of a dot or the space between two dots) so that the keyer output would appear to start immediately after a key closure.

9. A repeat capability should be installed to allow a sequence such as CQ CQ CQ DE W1GCA W1GCA W1GCA CQ CQ CQ DE W1GCA W1GCA W1GCA K (stop) to be shortened to CQ CQ CQ DE W1GCA W1GCA W1GCA (repeat) K (stop). The repeat command would be executed once, and ignored the second time through the sequence.

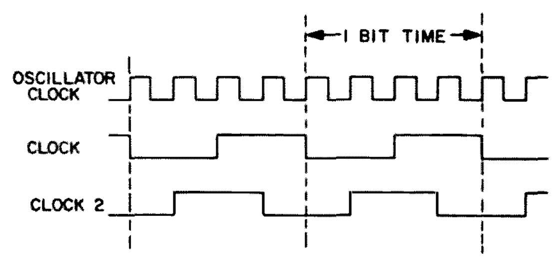

Fig. 1. The two phase clock used in MOSKEY.

I built such a keyer using SN7400 series TTL logic and received many comments on the "gud fist" on 40 CW. The "breadboard" keyer, setting on a TV tray in the shack, was used successfully for over a year. Since its original construction I made several improvements to it and decided to rebuild it using CMOS logic. This article describes the CMOS version which is currently in use.

Description

MOSKEY contains approximately 40 integrated circuits. The number can vary depending on whether you would like to install a Read Only Memory in addition to the programmable memory. This first part of the series describes the basic Iambic keyer with letter and word space capability, and the two phase clock generator. MOSKEY logic levels are in positive logic; a high = logic 1 = 5V, a low = logic zero = 0V.

The Basic Keyer

Figure 1 shows the relationship of the two phase free running clock used in the keyer. Clock 2 occurs in the middle of a bit time and is used to reset the dot latch and dash latch as each dot or dash is sent from the key. It is also used to generate the write pulse for storing information in memory, and to advance the memory address counter after writing into memory or reading from memory.

Fig. 2, is a block diagram of the basic Iambic keyer. It is simplified to the extent that no memory related functions are included. The keyer uses a 9 bit binary counter which is programmable to count either 256 or 512 clock pulses. A unit time element (which is a dot or the space between two dots) is the time required for the counter to count off 128 clock pulses. When a dot is sent, the counter is programmed to count off 256 clock pulses, the first 128 of which is the dot element with the output flip-flop turned on, and the second 128 clock pulses, the space element, with the output flip-flop turned off. When a dash is sent the counter is programmed to count off 512 clock pulses, the first 384 being the dash element, 3 time units in length (384 clocks ÷ 128 clocks/time unit = 3 time units) with the output flip-flop turned on and the last 128 clocks, the space element with the output flip-flop turned off. During the last bit time of the space element following a dot or a dash, the counter outputs an End of Instruction signal used by various parts of the keyer.

When the dot key is closed it will set the dot latch. This causes the selector latch to lock up in the dot mode, outputting a signal to the counter, starting a dot sequence to begin. The dash key can be closed, setting the dash latch, but the selector latch remains locked up in the dot mode. When the counter completes the dot, Clock 2 during the 2nd and 3rd quarter of the EOI bit time holds the dot latch reset and releases the selector latch. If the dash latch was set, the selector latch will flip states and lock up in the dash mode. This programs the counter to count off 512 clock pulses, outputting a dash and a space. At the end of the dash,

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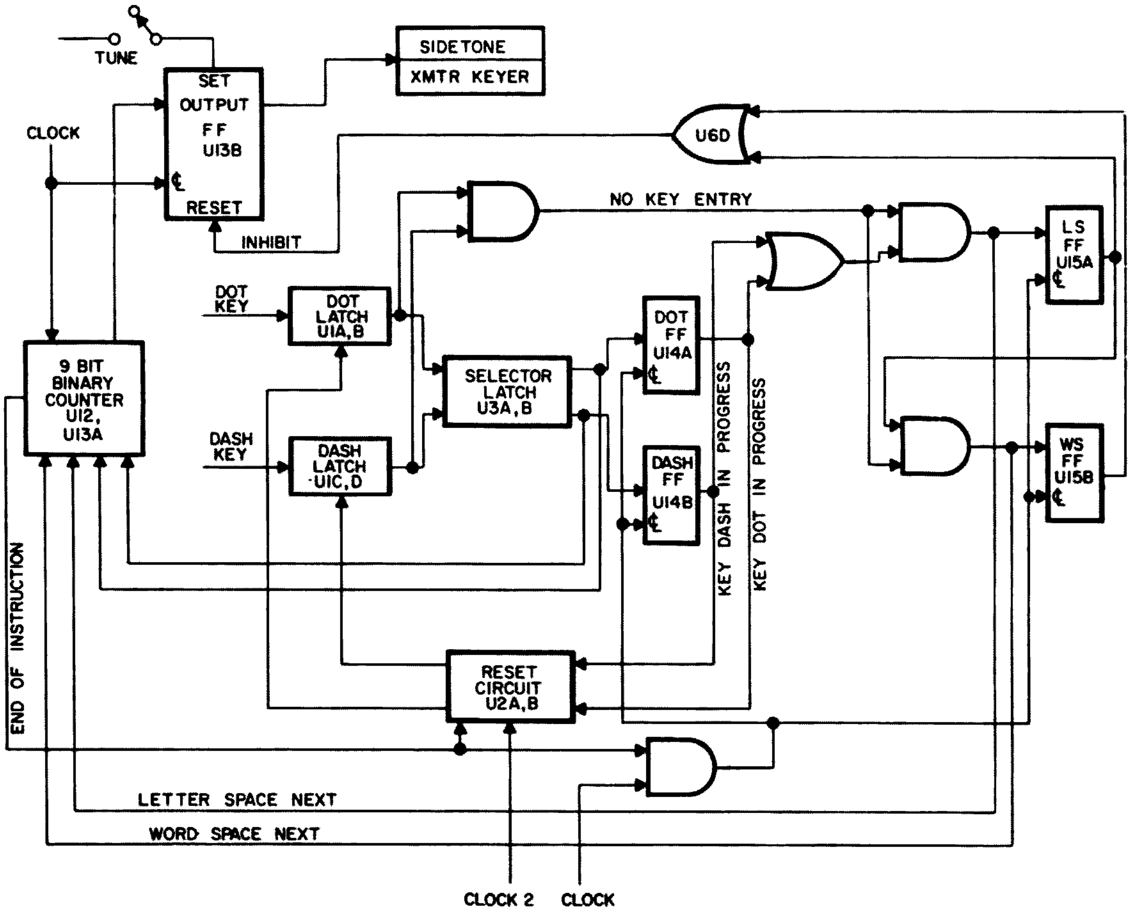


Fig. 2. Basic Iambic keyer. No memory related functions are shown. Schematic references are shown where appropriate.

EOI will go high and the reset circuitry will hold the dash latch reset during the 2nd and 3rd quarters of the EOI bit time and release the selector latch. The dot and dash latches permit alternating dot and dash outputs for Iambic operation if both the dot and the dash paddles are squeezed simultaneously. If 2 or more dots are desired the dot key is kept closed only. At the end of the dot, the dot latch is reset during the 2nd and 3rd quarters of the EOI bit time and the selector latch released. When the reset pulse goes away the dot latch will be set again during the 4th quarter of the EOI bit time and the selector latch locked up again in the dot mode. The dash circuit operates in the exact same manner. Also a dot can be inserted into a string of dashes by just squeezing the dot key and releasing it, while keeping the dash key closed. In a similar manner a dash can be inserted into a string of dots.

When the keyer completes a dot or a dash and there are no further entries from the key then both the dot latch and the dash latch will be cleared. Either KEY DOT IN PROGRESS or KEY DASH IN PROGRESS is high depending on the last character sent. This makes LETTER SPACE NEXT high and LETTER SPACE FF will get clocked high causing the keyer to begin a letter space sequence. The counter is programmed to count off 256 clock pulses, or 2 time units. Actually the keyer enters the dot mode and sends a dot, but INHIBIT keeps the output flip-flop from turning on and the keyer times out a 2 unit space. This 2 unit space when added to the space at the end of the dot or dash just sent gives a 3 unit letter space. When the letter space is complete and there are still no entries from the key then the keyer will begin a word space sequence and the word space flip-flop will be set. The counter is programmed to count off 512 clock pulses, or 4 time units. The keyer actually enters the dash mode,but again, INHIBIT keeps the output flip-flop from

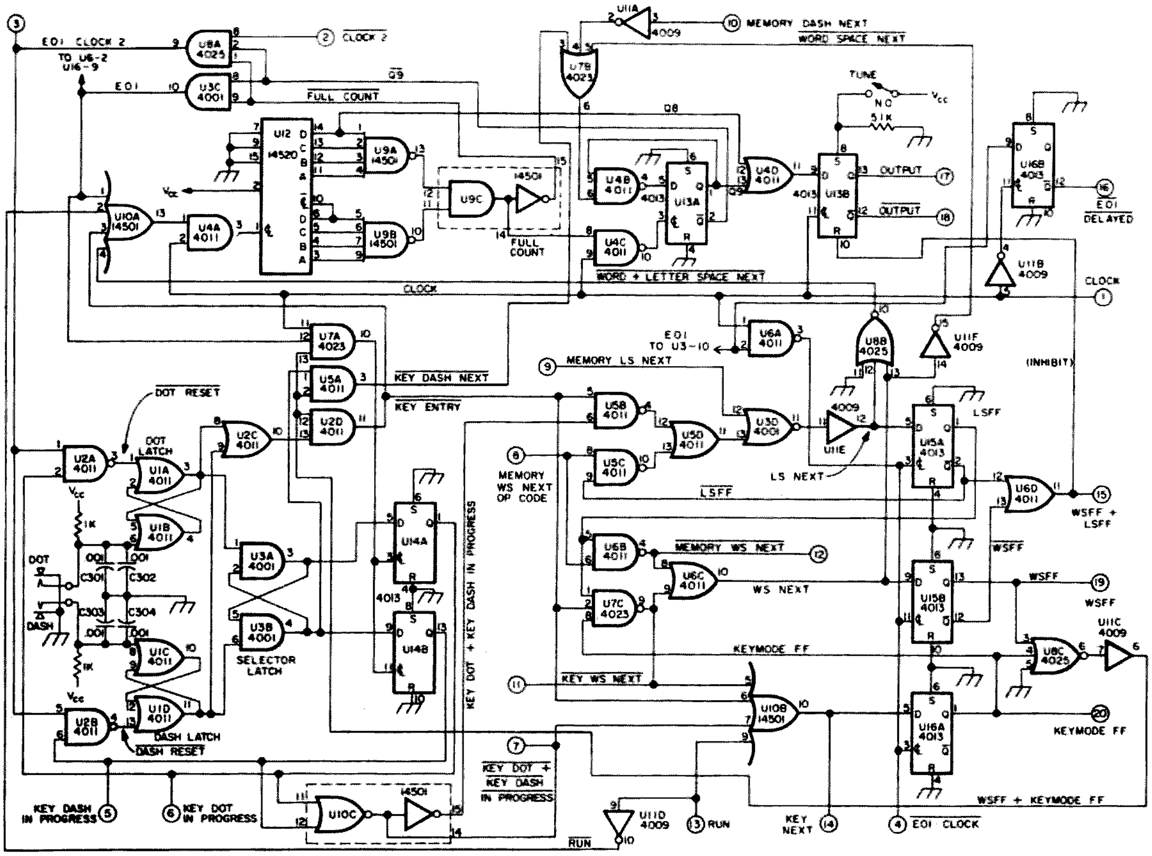
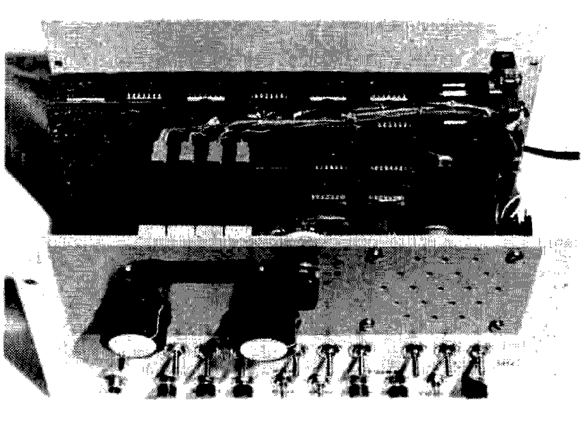


Fig. 3,

turning on. This 4 unit space when added to the previous 3 unit space gives a 7 unit word space.

If during the letter space sequence, an entry was made from the key, then after completing the letter space the keyer will not enter the word space mode, but send the dot or dash just entered. After completing a word space, if no entries have been made from the key, then the keyer goes into an idling mode. The 9 bit counter is shut off in



Top View of Moskey

the all 1's state and the keyer waits for a dot or dash entry to start it off again.

The clock used in the keyer is free running all the time. If the keyer is idling and a dot or dash is entered from the key, as much as a full clock period could go by before the keyer begins to execute the dot or the dash. The output flip-flop is clocked ½ of a clock period after the keyer actually starts the dot or dash sequence. This means that the keyer output could be delayed as much as 1.5/128 time units after a key closure. This is only 1.15% of a unit time interval. I have not been able to notice any delay from a key entry to when the output actually starts, even at the slowest keying speeds. Nor have I experienced any problems with sending at high speeds.

The schematic for the basic part of the keyer is shown in Fig. 3. The circles with numbers in them are connections to other parts of the keyer. For example, all connections labeled number 1 are to be connected together when the final unit is assembled. There are several connections to the memory part of the circuit which have not been

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explained yet, but they will be covered in Part II of this series. C301 through C304 are

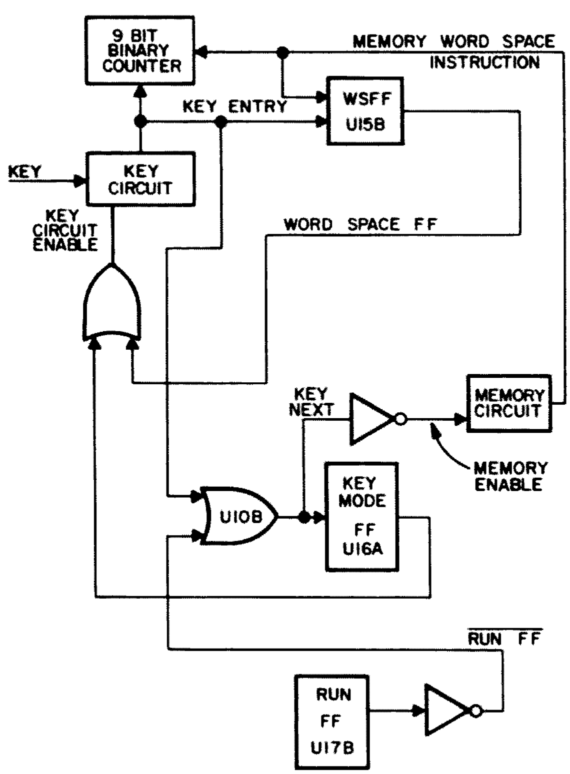

Fig. 4. Signal flow for a key interrupt at the end of any memory word space.

rf bypass capacitors. I recommend placing C301 and C303 at the key input jack on the panel and placing C302 and C304 on the circuit card near the inputs to U1. Most of Fig. 3, is covered in the description of the block diagram, Fig. 2. U16B EOI DELAYED BAR is used in the memory circuit to advance the memory after reading from memory or writing into memory.

Interrupting Memory Sending

U16A KEYMODE FF is associated with the interrupt portion of the keyer. There are 3 modes the keyer can be in when sending;

1. sending from the key only.
2. sending from the memory only.
3. interrupting the memory sending at the end of any word space and enabling the key. When key entries stop, go back to sending from memory.

KEYMODE FF and RUN FF are used to define these 3 states of the keyer. Fig. 4, is a simplified block diagram of the interrupt logic involved to have inputs from the key interrupt memory sending at the end of any word space. During each word space sent from memory the key circuit is enabled and any previously stored dot or dash, which can be entered into the dot latch or dash latch at any time, or any entry during the word space will cause control to shift to the key at the end of the memory word space. The memory circuit is disabled and KEYMODE FF will be set. Control will remain from the key input until a word space is finally sent from the key and no new entries are made. (The key can remain in control for as long as desired as long as new entries are continued to be made before a key word space times out completely.) Then control will shift back to memory and the remainder of the sequence stored in memory will be sent. The memory can be interrupted as often as desired and no characters stored in memory will be lost or skipped.

As an example of the usefulness of the interrupt I have the following sequence stored in my PROM: "DE W1GCA TNX FER THE CALL OM $\overline{\text{BT}}$ UR RST IS HR IN ENFIELD, CT ENFIELD, CT $\overline{\text{BT}}$ NAME HR IS ED ED ED $\overline{\text{BT}}$ SO BK TO U DE W1GCA K (stop)." After having the keyer call CQ for me, and I get an answer, I

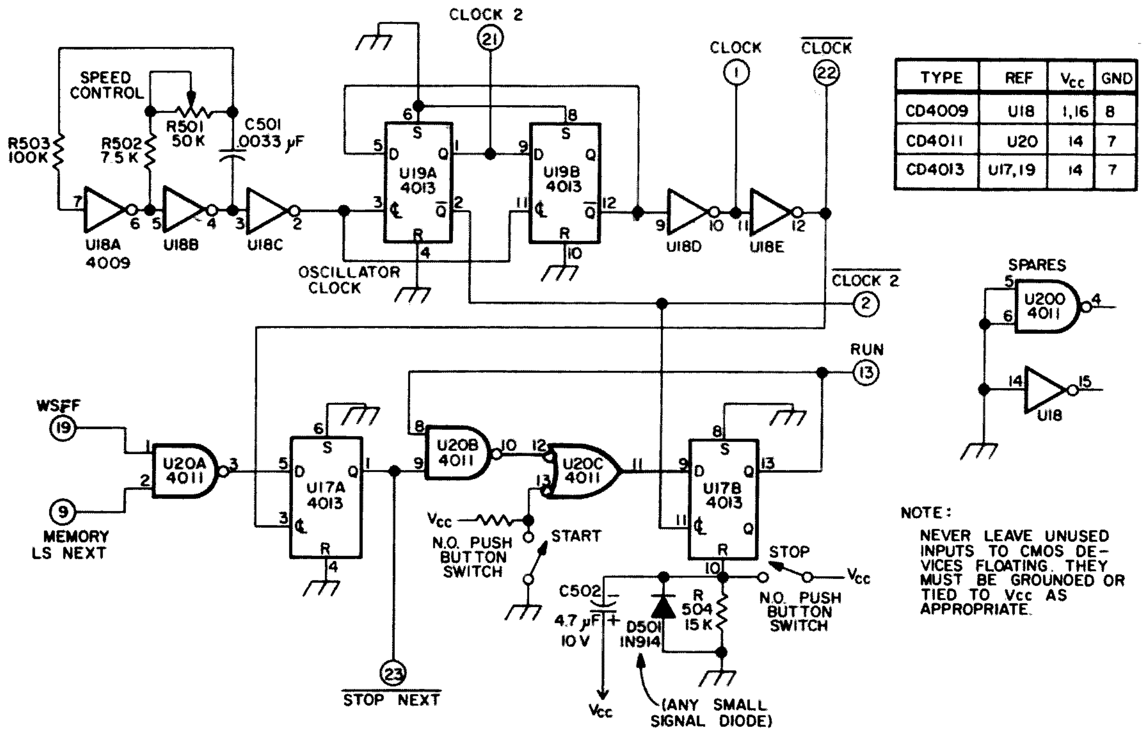

Fig. 5. Schematic of two phase clock generator and control circuit for starting and stopping memory sending.

send the station's call sign and press the START switch. The keyer picks up with "DE W1GCA TNX FER THE CALL OM BT UR RST IS." Then I insert his signal report from the key while I have had a chance to get half of the log book filled in. After sending the signal report, I go back to completing the log book while the keyer continues for me. When it sends ". . . SO BK TO U" I enter the station's call sign and then the keyer completes the transmission.

The clock circuit is shown in Fig. 5. U18A and B form the oscillator and U19 is a divide by 4 Johnson counter which generates the overlapping two phase clocks. R501, R502, and C501 are the frequency determining components of the oscillator and they can be varied to suit individual tastes. R503 is recommended for temperature and voltage stabilization of the oscillator and its value should be twice the total of the sum of R501 max and R502.

Again referring to Fig. 5, the RUN flip-flop is set when the keyer is sending from memory. When the start switch is pushed the flip-flop will be clocked high causing the memory circuits to be enabled. I will discuss in more detail the stop and repeat instructions in the next part of this series, but for now, when the keyer is sending a word space and MEMORY LETTER SPACE NEXT is high this is interpreted as a stop command. STOP NEXT BAR will be clocked low and RUN flip-flop will be clocked low terminating sending from memory. When power is turned on the RUN flip-flop could come up in either state and the keyer might start sending from memory. The power on reset circuit consisting of R504, C502 and D501 clears the RUN flip-flop on a power turn on. The stop switch can be used to manually terminate sending from memory.

The next part of this series will discuss the memory circuit and memory coding.

TYPE	REF	Vcc	GND
CD4001	U3	14	7
CD4009	W11	1,16	8
CD4011	U1, 2, 4, 5, 6	14	7
CD4013	U13,14,15,16	14	7
CD4023	U7	14	7
CD4025	U8	14	7
MC14501	U9,10	16	8
MC14520	U12	16	8

CD40XX are RCA part numbers. MC140XX are Motorola pin for pin equivalents – for example for U3, either RCA CD4001 or Motorola MC14001 can be used. MC145XX are Motorola parts only, no RCA substitute.

. . . W3HPX

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A Ham Radio *Severe Weather* Warning Net

My experience with severe weather started in the late 50's with weather watch episodes as part of a Civil Defense system. Many nights were spent watching the dark skies and trying to locate tornadoes. Later, a fellow engineer, also a ham, whose home was damaged during the 1957 Kansas City tornado, suggested we work on an electronic means to detect tornadoes. I have been working toward that goal ever since. As will be explained, I think the key to this detection system may have been discovered.

The electrical monitoring of severe weather conditions is generally called "sferics" – an abbreviation for atmospheric electromagnetic radiation. Tremendous quantities of energy are released during thunderstorms in the form of electrical discharges. As with any type of electrical discharge there is electromagnetic radiation (radio waves) generated. For sferics, the radiation spectrum includes frequencies from 10 kHz up into the UHF bands. We hear a portion of this radiation on the ham bands and call it QRN. Although QRN is unwanted on the ham bands, it appears to be very useful to detect severe weather.

Many methods have been used to measure the sferics and attempt to determine a warning condition for severe weather. The simplest method is to measure the discharge rate. As the storm builds in intensity the discharge rate also increases. Recently, the use of a TV set has been described to monitor the VHF radiation from the tornado. More sophisticated methods have been used including: comparing activity at different frequencies and locating each discharge event via a multiple station direction finding system.

I decided to investigate the 10 kHz radiation because it is easier to work with and has a long range. My first attempt was a simple discharge rate measurement with a homemade strip chart recorder. The recorder indicated if the storm was getting stronger or dissipating but gave no indication of direction. If several storm fronts were within range, the discharge rate (sum of all fronts) was confusing. The next attempt was a scope monitor similar to the one that will be described later in this article. This provided some improvement in locating fronts but still no way of "labeling" a tornado. It was also necessary to watch the scope continuously in order to note activity and detect changes.

To reduce the chance of missing a tornado, circuitry was designed which

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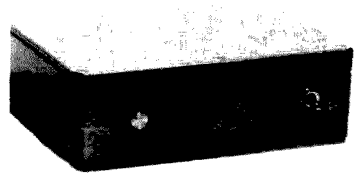

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translated the sferic events to a digital form which represented the direction of the event. This digital data was accumulated and stored in a memory. Periodically, this accumulation was read out and recorded. Now the sferics could be monitored and recorded continuously as the equipment operated unattended 24 hours a day.

With the accumulation of events per direction, the storm fronts could be followed from the Rockies to the Atlantic. Fronts from different directions were easily separated and each storm front intensity could be crudely measured. But, still nothing that could be used to label the front as capable of producing a tornado.

The Discovery

Last year I added circuitry to simultaneously display the amplitude and direction of each event in a rectangular coordinate form. The results of this improvement have been amazing. Several unexpected patterns were observed. With this display, each event appears as a dot representing the specific amplitude and direction of that event. When the events were accumulated (time exposure with a camera) a profile appeared as illustrated in Fig. 1. As the cloud formation progressed, four identifiable patterns became apparent from watching the display. During the initial stage, there were random events which had a definite amplitude-direction relationship (fell within the profile). This stage generally occurred for many hours. At the leading edge (A), there were no little signals.

During the second stage, one event appeared to trigger an adjacent event. This produced a "domino" effect with multiple events from one end of the formation to the other (e.g., A to B to C or D to C to B). These events appeared in sequence within the profile and would travel in either direction.

The third stage included the domino effect with the appearance of smaller signals at the leading edge (x's). Where previously there were no small signals, a variety of smaller signals would appear at the beginning or end of a domino sequence. These additional signals occurred from the leading edge direction. I think this condition indicated some probability of an impending tornado.

The last stage consisted of only signals from the leading edge location but of all amplitudes. The domino sequences seemed to disappear. This stage has rarely been observed and I think it indicates actual tornado.

Although the observations are real, the relationship to actual weather and cloud formation is only my speculation. I have many photographs showing the patterns but no positive correlation with actual tornado activity. There have been times when tornado activity was indicated by the monitor but none reported. Other times tornadoes have been reported but only high activity (not tornado) indicated by the monitor. Most of the time the monitor indicates high activity where severe weather and tornadoes have been reported. Of course, I cannot watch the monitor full time and do not have the time or facilities to track down reports or search for tornadoes which might not have been reported. After

you monitor severe weather for a while, you begin to wonder about the validity of many severe weather reports that are published by both the media and the weather bureau.

After some experience, I could estimate the severe weather location by noting the cold front position along with allowances for the general direction and speed that most storms travel. With my limited time and facilities, I have become frustrated trying to determine the meaning of these apparently orderly patterns from the sferics monitoring.

This monitoring system has now arrived at a point where help is needed. More stations are needed to pinpoint suspected cloud formations. Observers are needed to investigate both conditions indicated by the monitoring system and the severe weather reported by the public.

A Weather Net?

I have visualized a Ham Radio Severe Weather Warning Net. What a "feather" in our hat if we could develop a *reliable* tornado warning system for most of the country. There is a place in this system for everyone from the "meteorologist' to watch clouds and run down tornado reports to the "engineer" who could build and operate the monitoring equipment.

Let me describe my first thought about this system. I can see a club project to build and operate one of the somewhat complicated monitoring stations. Other interested persons could trace weather reports and observe actual weather conditions. There is also a need for a central data collecting and analyzing location. All of these separate operations would naturally be connected via the various ham bands (FM repeaters, SSB phone nets, and even possible automatic data transmission via RTTY or SSTV). It sounds like a big bite but I think the possible results are worth "having a go at it."

If my speculations are correct, I believe that this warning net could locate and *predict* tornado activity. Instead of warning a large area, the warning could be issued for only those within 20 to 50 miles of the indicated locations. Up-to-date predictions of activity as it moves along would also be available.

Monitor Characteristics

Monitoring equipment to detect the severe weather conditions can vary from a simple scope or CRT display of each discharge event as it happens, to computer type circuitry with memory capability to accumulate data from all events of a time period. Three displays and how they present a cloud formation are illustrated in Fig. 1.

All systems that I have used start with the same crossed-loop sense-wire antenna arrangement and three associated amplifiers, Fig. 1. If the loop amplifier outputs are applied to the CRT deflection plates and the sense amplifier output is applied to the CRT grid or intensification input, the direction of the incoming event can be displayed (polar display). Each event is displayed as a momentary trace from the center of the CRT outward in the direction of the received signal.

The next step in sophistication converts the signals from the three amplifiers into two signals. The two signals represent direction and amplitude. When these signals are applied to the horizontal and vertical plates, the horizontal axis becomes direction and the vertical axis becomes amplitude (rectangular amplitude-direction display). Each event appears as a dot at a location representing the specific amplitude and direction of the event. The domino sequences are very easy to observe with this display. This sounds like the end of the line but the eyeball-brain is still used as the observer-analyzer. When there are several formations to be observed, it seems that the eye is always looking in the wrong direction when something occurs. Obviously, some events are missed if they occur simultaneously. Several active fronts tend to light up the whole CRT and it becomes difficult to analyze each front. The human eye and brain are also poor for remembering and analyzing events that occur more than a few seconds apart.

When the speed and memory requirement exceed the human capability, we call in the "computer." The next step is to accumulate each event in channels which represent many specific amplitude and direction combinations. All events for each amplitude-direction combination are counted and the total count stored in a memory. Now each

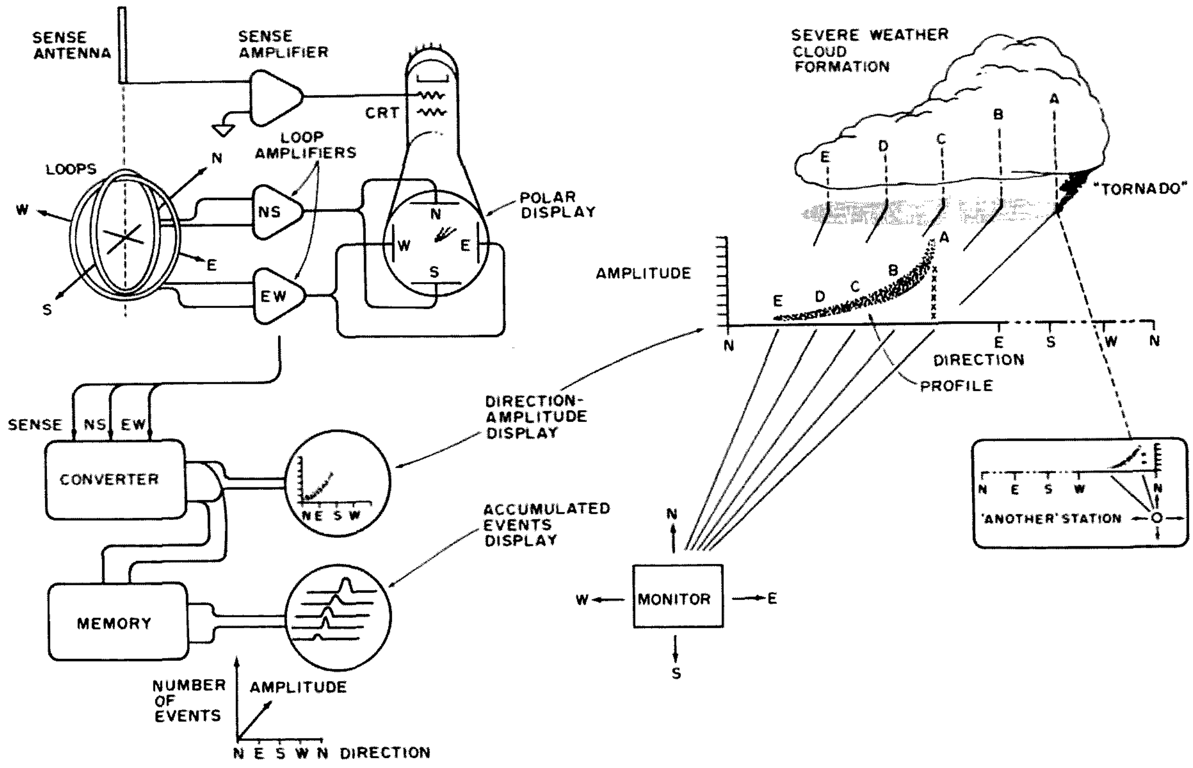


Fig. 1. Severe weather warning system.

event is "observed." The accumulation display, Fig. 1, provides a readout with a three dimensional effect. This accumulation presents trends and concentrations that are not noticeable during realtime observation. Low activity fronts that produce only a few events per minute in the early stages are easily detected. The accumulation also improves the directional accuracy since the average of many events can be measured. The best monitoring station appears to be a combination of the last two descriptions with the amplitude-direction display to detect the domino sequences and the accumulation circuitry to detect low activity and provide directional accuracy.

Monitor Description

The remainder of this article will describe a few highlights of a polar display monitor. This description is intended more for reference and information than for construction detail. Most of this monitor circuitry can also be used with the converter and memory units. The converter circuitry consists of about 6 op amps and several CMOS digital ICs. The memory unit is a little more involved with about two dozen digital ICs.

Loops

All monitors start with a set of loops. I have used two basic types as shown in Fig. 2. For several years I used the ferrite rod version mounted to the basement ceiling. After I moved these loops to the attic about the only difference noted was a reduction in interference from the electrical equipment in the house. I am now using the balanced version which gives about a five times improvement in sensitivity.

There are several important points concerning the construction and location of the loops that should be mentioned. First, it is very important to make both loops as identical as possible. Since there is no way to provide a direction calibrating source, the calibration must rely on a simulated input signal. If the loop amplifiers have identical response and the loops are also identical, then the direction display should be accurate.

Obviously, the loops should be aligned with the cardinal compass points as accurately as possible. Since it is difficult to construct crossed loops as illustrated in Fig. 1, the loops can be mounted several diameters apart. Note that the maximum

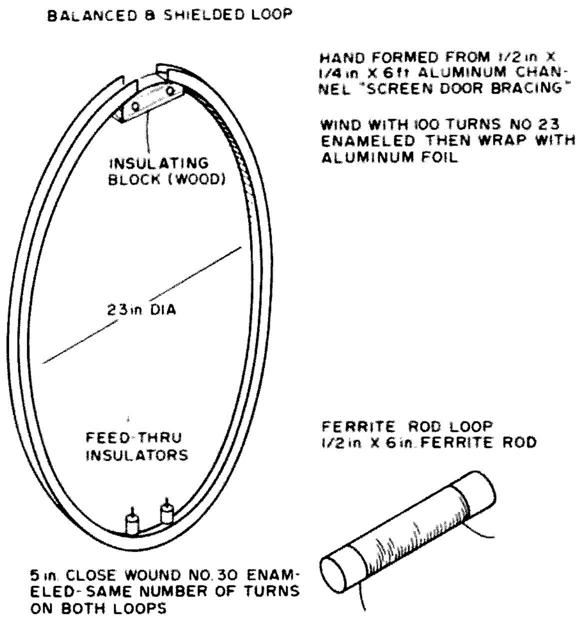


Fig. 2. Loop construction.

pickup is in line with the loop *winding* plane, e.g., the N/S loop winding will form a circle as viewed from the east or west. The loops should be mounted clear of all metal, especially iron. Mounting height is not important other than to clear metal objects (known and *unknown*).

Theoretically, the distributed capacity and loading should be balanced and the loop winding shielded to prevent stray (electrostatic) pickup. From my experience with the two versions, I can't find a real need for balancing and shielding. It appears that the small ferrite loops are not large enough to have noticeable stray pickup. The larger loop performance might suffer without shielding but I am doubtful if the balancing is necessary. Improper loop pickup will only affect the direction accuracy and cause more elliptical traces but will not affect the sensitivity. This is an area where more experimentation might be fruitful.

The loop drawings in Fig. 2, should be self-explanatory. Remember to keep both loops identical. The shielding for the balanced loop must not form a shorted turn, e.g., both the channel and the aluminum foil must not be continuous at the top of the loop. Wire for the balanced loop can be obtained from Nurmi Electronic Supply, 1727 Donna Road, West Palm Beach FL 33401. Each loop requires about 1¼ lbs. of #23 enameled wire. I used a two wire shielded microphone cable for transmission line between the loops and the monitor. Cable capacity is not a problem. Other winding forms can be used as long as the total inductance is from 10 to 20 mH. In all cases the loops are tuned to 10 kHz. Other loop inductance requires changing the amplifier input to maintain a loaded Q around ten.

The sense wire is a simple antenna. It should be a vertical and as high as possible with a shielded lead-in. But, again, this isn't absolutely necessary. I use about 6.1 meters (20') of wire mounted about 61cm (2') above the roof of a one story house. There may be a disadvantage with a large sense antenna since it would be more sensitive to charge pickup from lightning. So far, I have not had circuit damage from lightning.

Loop Amplifier

The amplifiers are built around a favorite feedback circuit that uses two silicon transistors. This circuit has been very useful for me over the years. A few descriptive words are in order since the circuit can be used for other applications.

A typical circuit is shown in Fig. 3. Rb serves a dual purpose as both feedback and bias resistor. In most applications, the input base current is very small and the stage will reach a bias condition where the output voltage is nearly equal to the input base voltage. Since both transistor base junctions are in series, this steady state output voltage will be two diode drops or about 1.2V.

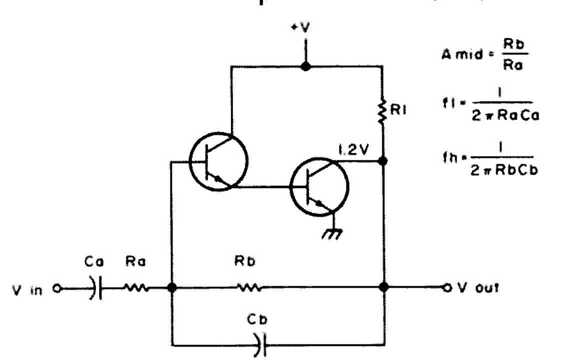


Fig. 3. Basic amplifier.

An input signal will cause a current to flow thru Ra. Since the amplifier gain is negative, this input current will cause an opposite polarity signal at the output. Some of this output signal will return via Rb to oppose the input current. This feedback action will tend to keep the voltage at the

Ra-Rb junction from changing. If the amplifier gain is very high, the voltage change at the junction will be very small. This junction is now acting as a current summing point and is sometimes called a virtual ground – it appears like a ground since no signal voltage is apparent.

Since the Ra-Rb junction appears like a ground point, the input signal will appear across Ra-Ca and the output signal will appear across Rb-Cb. The mid-frequency gain becomes the ratio of Rb to Ra. The low and high frequency response is controlled by Ra-Ca and Rb-Cb, respectively. Both high and low cutoff frequencies (3dB down) occur at the frequency where the capacitive reactance is equal to the resistance ($R=1/2\pi FC$). For all practical purposes, these calculations are sufficient if the required stage gain is 30 or less. This circuit has proven stable with a variety of feedback arrangements, several of which are used in this monitor.

The loops are loaded with the amplifier input resistance (6.04k) and a second (6.04k to ground which maintains the loop balance, see Fig. 4. The total resistance across the loop is used to provide a loaded Q or about ten. This loaded Q is important since it determines the signal extracted from the broadband sferic wave front. High Q will cause the damped oscillation to continue for a long time and possibly override other events. Low Q does not provide a true L-C oscillation which could cause an error in the direction display.

The first two stages have the same gain and frequency response. Low frequency cutoff has been selected at 1000 kHz with the high frequency cutoff over 100 kHz. Total gain of the two stages is about 1000.

A gain switch has been included to provide some adjustment for larger signals Variable controls are unsatisfactory since both channels must have matched gain response at all times. More switch positions could be incorporated but I have found two positions adequate.

The deflection amplifier stage, shown in Fig. 4, includes a dual triode to provide the large voltage swings necessary for the CRT deflection plates. The triode sections are driven in a grounded grid configuration with the plate currents equal to the respective transistor collector currents. Essentially, the emitter currents are also equal to the collector and plate currents. The two emitter current paths come together and flow thru the 3.9k to the -8V power supply. Since the emitter voltage (Q6) can't change appreciably, the current thru the 3.9k will remain essentially constant. As a result, any increase (or decrease) in current thru one side of the amplifier will result in an equal decrease (or increase) in the other side or push-pull operation. The current thru the 2.2k de-

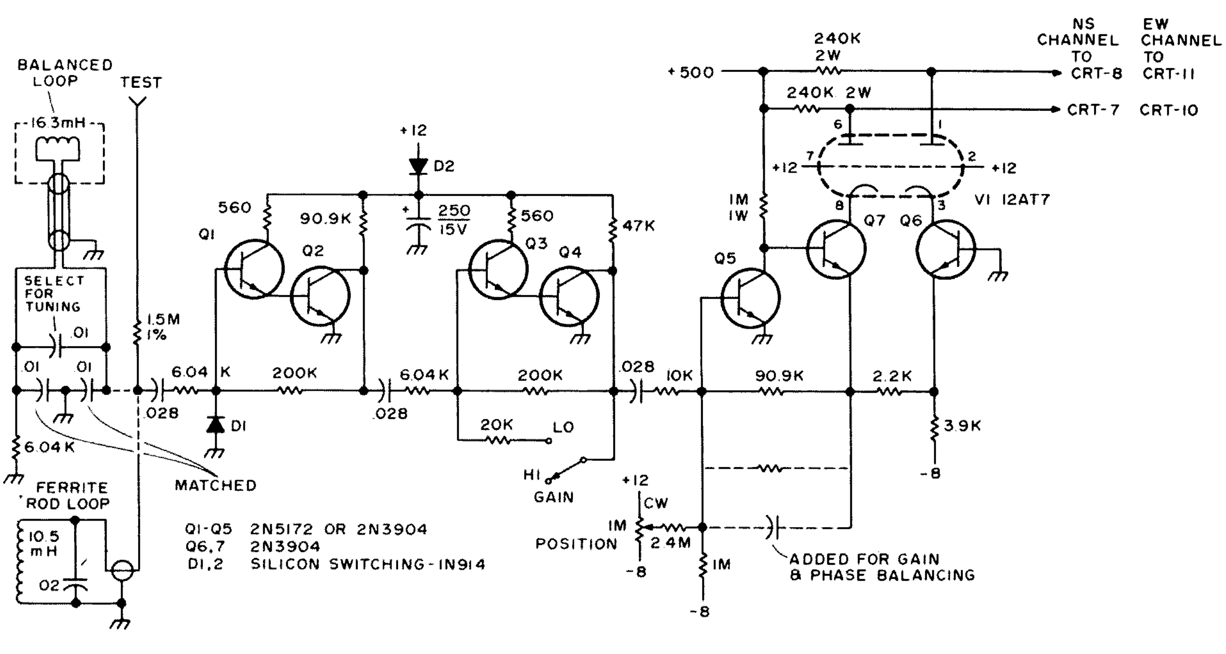


Fig. 4. Loop and deflection amplifiers.

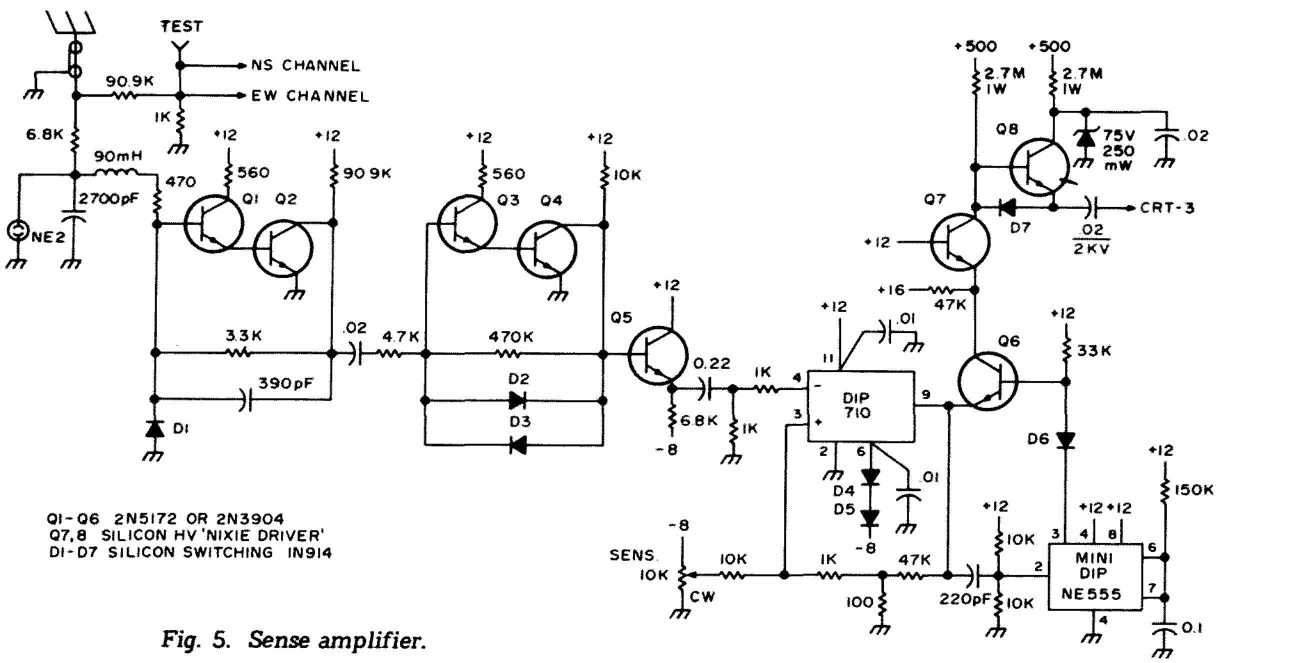


Fig. 5. Sense amplifier.

velops a voltage which causes a feedback current thru the 90.9k and the 10k.. The Q5 base becomes a current summing point similar to the previous feedback discussion.

Sense Amplifier

The sense amplifier shown in Fig. 5, is a combination of several circuits. The input signal is generated by the antenna exciting the tuned circuit. A 90° phase shift is necessary to align the sense signal with the signals in the loops. This phase shift is accomplished by feeding the tuned circuit current (instead of voltage) to the input amplifier stage. The virtual ground or summing point characteristic of the basic amplifier is useful here. The 470Ω series resistance was necessary to lower the loaded Q to about ten. A neon bulb and diode have been added to protect the circuit from large overload signals (nearby lightning, etc.). The high frequency cutoff has been made as low as practicable to reduce local radio station interference.

The second stage is similar to the loop amplifier stages with the addition of diodes which limit or clip the signal. The diode clipping reduces the signal range to the comparator which provides easier sensitivity adjustment. These diodes, along with other apparently meaningless resistors in other amplifier stages, have been included to reduce overload effects from the very large signals.

The 710 IC is used as a conventional comparator with additional positive feedback thru the 47k and 100Ω resistors. The feedback improves the switching characteristics with the relatively slow (and noisy) 10 kHz signal. The minimum signal level necessary for intensification is adjusted by the SENS (sensitivity) control.

A NE555 timer IC has been used to block the intensification after the first cycle. If the blocking is not used, each event will be displayed with several traces as the signal from the input L-C circuit oscillation dies out. These additional traces tend to hide other events of lower amplitude. Without the blanking, the multiple events (domino) will appear very similar to the multiple traces from the damped oscillations. Even with the blanking, domino sequences are difficult to observe.

The remaining transistors provide a high voltage switching function to drive the CRT grid. Don't worry about the 500V supply to these transistors as it is clamped by the zener diode to a safe value. The two transistors (Q13 and 14) should have a Vceo of 100V. Most "nixie" driver types should be OK.

Power Supply and CRT

The power supply circuitry, in Fig. 6, is conventional. A larger-than-necessary scope transformer happened to be available. Series

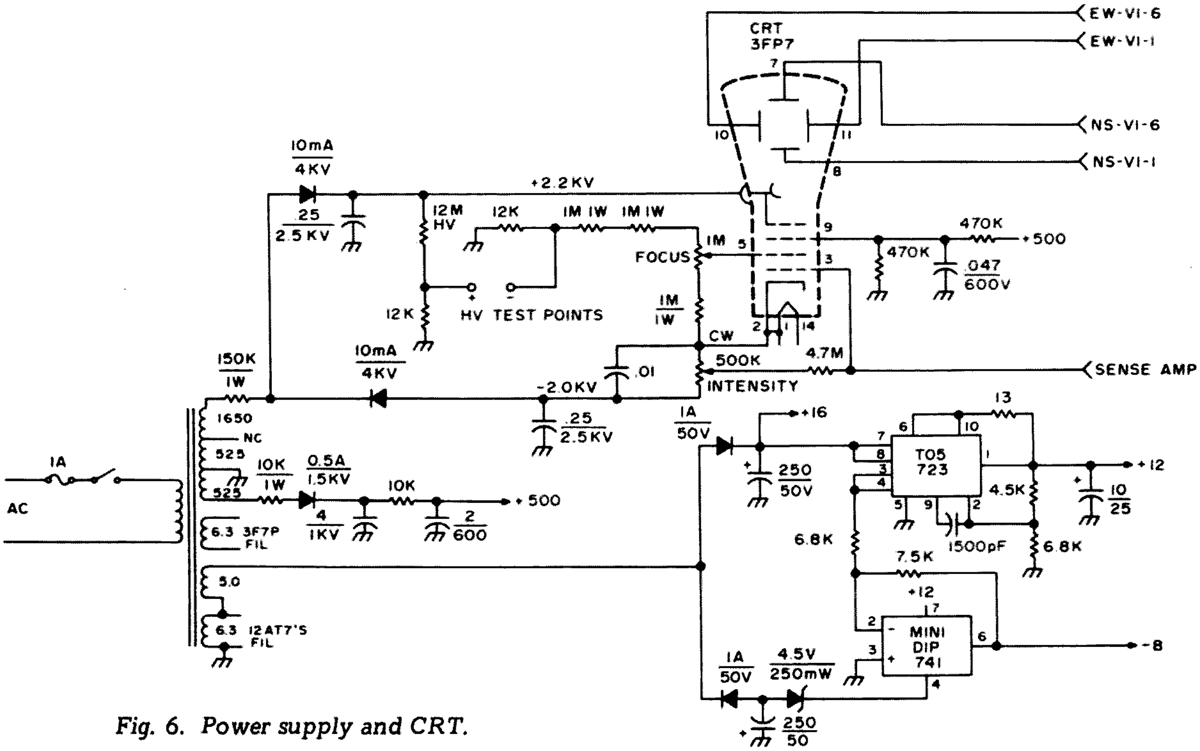


Fig. 6. Power supply and CRT.

resistors were added to both high voltage supplies to reduce the voltage to the values shown. Current requirements for the 500V supply is about 10mA so any transformer with similar voltages should be satisfactory. Remember, the filament winding for the CRT must be insulated for 2kV.

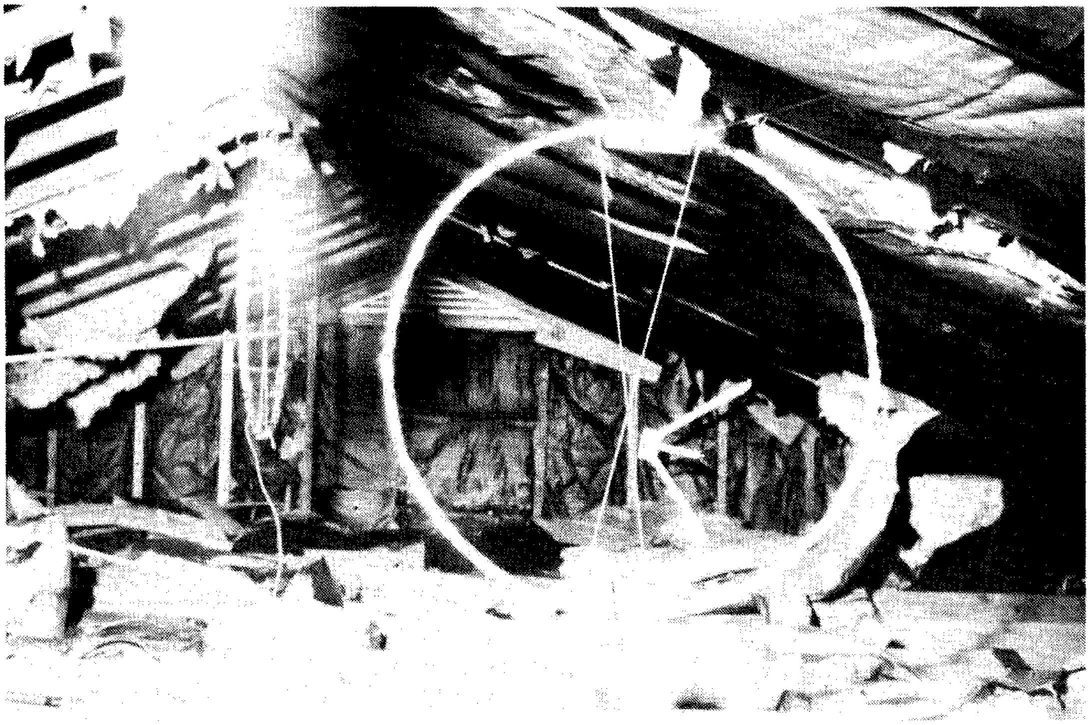
The accelerating voltage (4.2 kV) is necessary to provide the high beam current during intensification. Some scope circuits, with lower accelerating voltages, may not provide sufficient trace brightness. This CRT application differs from the average scope because the trace is only intensified during a single one-half cycle of the 10 kHz input signal or for only about 50 μs. Without sufficient accelerating voltage, it is difficult to maintain high trace brightness with decent focus. The CRT shown has a P7 phosphor (fast blue and slow orange) which also requires more beam current to excite the slow orange component. The slow orange trace gives the observer a little longer to judge the event. There is also some memory effect which helps compare successive events during high activity.

Construction

One construction detail which needs special attention is the separation and layout of the amplifier channels to eliminate cross coupling and pickup from the high voltage rectifiers. Any coupling between amplifiers may cause a direction error. This can be checked by temporarily shorting one amplifier input to ground. The trace should be aligned exactly with the other amplifier axis, e.g., short the E/W input and the trace should be vertical or N/S. Any deviation from the axis could indicate cross coupling or a misaligned CRT.

The component values shown in the schematics describe the actual components used. I happen to have a good precision resistor stock so several precision resistors have been used for stability and matching between channels. Again, it is necessary to make the two loop amplifiers as identical as practical. The corresponding feedback resistors (6.04k and 200k) and the coupling capacitors (.028) should be matched between the channels. The actual values are not too important but the matching between channels should be given some attention. Otherwise the circuitry is tolerant to some component substitution.

There is one feature which I do not have but should be considered. Since the events are only displayed momentarily, it is difficult to remember the location of the previous traces. It would be very useful to have



Balanced loops sharing attic with TV antenna.

several moveable index lines on the CRT face which could be used for reference. I have a hood in front of the CRT to shield the room light and haven't thought of a good way to add these index lines without defeating the hood purpose.

Adjustment

A 10 kHz sine wave (0-5V peak-to-peak) connected to the TEST input can be used to balance the amplifiers, adjust the sense tuned circuit, and tune the loops. The loop amplifiers are first balanced in the high gain switch position with the loops disconnected. During the balancing, the SENS control is turned counterclockwise (minimum sensitivity) and the INTENSITY control advanced for a visible trace. A parallel resistance and/or capacitance is added to the appropriate 90.9k resistor in the deflection amplifier circuit. The object of the balancing is to obtain a single line trace at exactly 45° (NE-SW). The amplifier gain (adjusted with resistance) affects the trace angle while the added capacitance (changes phase shift) corrects the double line or elliptical trace pattern. Start with about 300k and 10 pF variable components could be used but I prefer selection since there is no chance of accidental misadjustment.

After the amplifiers have been balanced in the high gain switch position, the low gain resistors can be selected following a similar procedure. Phase correction should not be necessary.

The loops are tuned by selecting capacitors to provide the same single line pattern. The low gain switch position should be used for loop tuning since the signal pickup with the loops connected will distort the trace in the high gain position. The loops should be mounted in position during the tuning.

The same test signal can be used to adjust the sense tuned circuit but the INTENSITY is reduced below the continous visible trace setting and the SENS is used to control the trace intensification. The sense antenna must be connected during the adjustment. With a suitable test signal level and SENS control setting, adjust the sense tuned circuit to intensify the trace equally in both directions from the CRT center. The SENS control setting will affect the distance of intensification from the center. Either the coil or the capacitance can be adjusted.

The loops must also be oriented for proper direction display on the CRT. If the socket pin notations on the schematic have been followed and the CRT mounted with pin 2 on the top, the following loop connections will give the standard direction display (north to the top, east to the right, etc.). The N/S loop should be connected so that the winding goes clockwise from the amplifier input to ground when looking to the west. Similarily, the E/W loop should go clockwise when facing north. Otherwise, it is a matter of connecting the loops and comparing the observed traces with the reported weather. There are only four possible loop connection combinations but it can be confusing if more than one weather front is within range.

Observation Notes

An ideal single event will appear as a line starting some distance from the CRT center (determined by the SENS setting) and pointing toward the signal source. The length of the trace (from center) is proportional to the signal amplitude. Some traces will be elliptical and others will be single lines. The elliptical patterns appear to be an effect of different signal paths. I think additional loop experimentation may be useful to clean up some of the elliptical patterns.

If the traces appear to intensify past the CRT center, readjust the sense tuned circuit until the intensification is as near the peak as possible. If no single line traces are observed, you should recheck the loop tuning and amplifier balance. The sporadic nature of the signals make much patience necessary to adjust and determine that the monitor is working correctly.

After all the adjustments have been completed, you can start to observe sferics. There is some activity throughout the year but the most active season is from early spring to late summer. Generally, the activity peaks during the early evening hours. The low activity may only be a few events per minute while during a storm the activity may reach several hundred per second.

Most cold fronts seem to generate sferics with activity starting from the low pressure location. As the intensity increases, the sferics activity spreads along the frontal line. This activity seems to concentrate at several locations along the line as indicated by the appearance of the domino sequences. The domino sequences are not easy to observe with this type of monitor. I would never have discovered the domino effect from this monitor only. Now that I know it exists, I can see sequences much of the time. There are several pointers that will help to observe these events. First, you have to imagine what the various amplitude-direction combinations should look like. This is relatively easy when the traces are single lines. But most of the time there is some elliptical effect. Second, you have to remember that the best "view" of the cloud formation is broadside. As an example, here in the Chicago area the fronts move predominantly from the west to the east. Therefore, the best 'view" is when the formations are either north or south ot Chicago. The formations approaching from the west or leaving toward the east generate sferics from the same general direction and the profiles are not as noticeable. Many of the observing problems are cured with the converter unit.

As I mentioned, I think there is a good chance that a useful severe weather warning net can be developed by Ham Radio. If those interested would drop me a line (SASE please), indicating how they would like to get involved, e.g., organize a club monitoring station, observe weather, run down severe weather reports, coordinate local activities, build and checkout equipment, be available to operate monitoring stations, etc., I will try to put it all together. I won't promise to personally answer all letters, but I will try to keep everybody informed either by articles in "73" or bulletin mailings. At this time, I have no idea what response to expect and, therefore, I can't commit myself to any definite plan.

In some of my contacts with meteorologists and other persons in the scientific community, I have professed that the "hams" have the facilities and the enthusiasm to develop and evaluate this severe weather detection system. I cannot believe that I have over estimated our capability.

...W9DTW

William P. Turner WAØABI
5 Chestnut Court
Saint Peters MO 63376

THE AGITABLE

One irritating part of printed circuit board production is the frequent agitation required of the etchant if the foil is to be removed in a reasonable length of time. The etchant in contact with the board becomes saturated with copper and unless fresh etchant is brought to the area, the etching process is likely to become long and drawn out. The 5 by 7 in. photographic trays I use for this work are equipped with a three-point suspension which makes them easy to agitate if one has nothing else to do. But I for one would rather spend my hobby time doing something constructive. Hence, the following mechanical agitator.

The motor used was advertised as a "display" type and evidently was made for use in a store window display. Several mail order houses sell similar types for less than $2. This particular motor has a 1/4 in. output shaft turning at 10 rpm. Other diameters and speeds would require a slightly different treatment in order to achieve the desired result, but the principle remains the same. A shaft coupling was attached to the shaft with a longer than necessary roundhead screw.

The motor was mounted on the outside of a 7 x 9 x 2 in. chassis with the shaft sticking thru a 1 3/4 in. hole in the 7 in. side. Immediately above the coupling setscrew, a 3/8 in. hole was drilled to accept a standard panel bearing. A piece of 1/4 in. brass shaft (aluminum will do) was cut to a length which brought it flush with the top of the panel bushing when the bottom of the shaft was resting on the body of the coupling.

The bottom of the shaft was drilled and tapped for a 6-32 roundhead machine screw and oversize washer. (The washer keeps the shaft from coming completely out of the bearing.)

As the motor rotates, the screw on the shaft coupling contacts the screw on the shaft, forcing it upward approximately 3/16 in. The amount of stroke is adjusted by changing the length of the coupling screw. Do not attempt to lengthen the stroke too much? this can only lead to the screwheads locking up and stalling the motor. If the speed of your motor is such that more agitation is necessary, it would be far better to add a second (or third) screw in the coupling so as to produce several strokes per revolution.

Near the opposite end of the chassis, two rubber feet were mounted to coincide with the feet on the tray. The tray feet fit into the screw recesses in the rubber feet and keep the tray from wandering.

In operation, the shaft, which forms the third suspension point for the tray, raises the end of the tray. This causes waves of etchant to wash across the PC board. I have found this gadget to decrease etching time by up to 50% and at the same time leave me free to do other things around the shack.

. . . WAØABI

E. M. Wagner G3BID
5 Ferncroft Avenue
London, N.E. 3
England

LXpedition

Having found the Grand Duchy of Luxembourg a very pleasant place to stay and an uncrowded country, I decided to go again in a little DXpedition.

I had asked my friend Max (F8TH) and his wife to join me and had chosen Beaufort, where I had been before, and which I liked and where the hotel management had been very cooperative about antennas, etc.

As I had business to do in Luxembourg City and F8TH did not, we decided to meet at the Meyer Hotel, Beaufort.

Since it was only about 20 miles north of Luxembourg City, I did not hurry. I left fairly late in leisurely fashion and decided to get to Beaufort for lunch.

I thought I would have lunch and go on the air mobile after lunch and talk my friend in, as I had been there before and knew the neighborhood as he did not. We both had reciprocal licenses for Luxembourg, of course.

In this I was frustrated. As I drove up to the hotel I saw a car I thought I recognized and, although there was no antenna mounted on it at the time, I saw the letters F8TH.

So my friends had arrived before me. Inquiry at the reception desk led to the information they were in the room next to mine, and so I went straight up. In fact, they had arrived only a few minutes earlier. So all was going well. Max and his charming wife had brought their dog along; a dachshund called, appropriately enough, "Lobe de Beam."

After a pleasant lunch in the comfortable hotel dining room we settled down to the anticipation of ten days of pleasant hamming with our two calls, F8TH/LX/M and G3BID/LX/M.

The hotel had given me the same room as last year, and so that afternoon we set about erecting our first antenna for the fixed station.

We fixed the antenna which had worked so well last year, and although it was put up in the same place, it never gave us as excellent results as it had done the previous year. We were never able to find out why.

L or R: ON4JF/M, G3BID/M, XYL of F8TH, F8TH/M and LX1RK. All mobile except LX1RK, and all the mobiles members of Amateur Radio Mobile Society.

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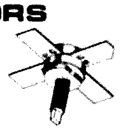

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We worked 5N2AAF, VK2AD, VK4HR and VK4KS on 20 meters, but somehow always felt that we were not doing as well as last year. It was on 15 meters that we really felt our performance was poor. We worked Walter (K1YZW), whom I work frequently from all sorts of locations, and he commented on the poor signal strength compared to other Europeans. Next day MP4TDA, whom I also know well, gave me 5 and 1 and also commented on the poor signal strength.

So, something had to be done about it, and Max and I put up a KW Trap Dipole in an inverted vee configuration. This was Max's idea; it worked splendidly, and reports were much better.

But it was the mobile operation which was most fun. We drove about the place in one car or the other, crossing the frontier into Germany and back on several occasions.

On one trip we worked W1BTU on both sides of the frontier, once as G3BID/LX/M and once as G3BID/DL/M, with only a short pause at the frontier where the German customs officer was very interested in operation and listened with interest.

Soon after entering Germany, we met Walter (K1YZW) again, and his report of our mobile signal was much better than from the fixed station earlier. We went on to Trier where we visited DL5SF whom both Max and I had contacted before, when Max was operating as G5AOV/M in England.

DL5SF, Bob Lefauconier, is a French officer serving in the French Army in Trier, and we had a very cordial reception at his apartment, and met his wife and children.

L to R: F8TH and XYL, DL4AP and XYL.

DL4AP at his station near Bitburg

Before leaving, we visited Hermann (DJ2BW), who was in the process of erecting a tower and a quad, and I do not think he could have been very pleased to have his work interrupted by our casual and unannounced visit, but he gave us a very warm and hospitaable reception.

On our return to Beaufort in the Grand Duchy of Luxembourg, we worked DL4AP on 20 meters and arranged to meet at the weekend.

Here I made a real fool of myself. I had worked him the year before, and also DL4EP, and had gone over to Bitburg Air Base where they were stationed. I had met Bob, DL4EP, last year, and his wife and children.

Now I got the two thoroughly mixed, and when DL4AP and his wife turned up on Saturday, I was surprised that I did not recognize him. However, I thought my memory for faces might be a bit weak. They arrived with a baby of about 4 months. I asked how the other two children were. Sid replied "This is our first one," pointing at the baby. Was my face red!

Then Sid solved the mystery. "You're thinking of Bob" he said, "DL4EP." In fact, I had never met DL4AP before! Sid is a grand guy and forgave me the stupid blunder.

Sid runs a Volkswagen Camper with a Swan 350 and Hustler antenna, and has been doing a lot of very good mobile DX recently. He has only been mobile a few months.

Later that afternoon ON4JF and his wife turned up, and then we had four nationalities all together – four different prefixes – DL4AP (American), ON4JF (Belgian), F8TH (French) and G3BID (British).

All four operate mobile, and all four are members of the Amateur Radio Mobile Society.

As mentioned earlier, I was in one of my blundering moods, and the next blunder was . . . I forgot to take a photograph of the four cars all equipped with mobile rigs.

Sid invited us over for dinner the following week. Then I committed the third blunder. I caught a cold and went to bed for a spell! Sid postponed the date, and though I wasn't okay to stay out for dinner, unfortunately, we went over for the afternoon and had a magnificent reception. They do not live on the base, but about 6 miles out, in a beautiful house right in the country with a wonderful view.

As a fixed station Sid runs a KWM2 and linear to a quad mounted on a tower, and what a signal he puts out.

Well, I had been frustrated in talking Max in to Beaufort because he had arrived before

DL4AP's QTH with his mobile camper Volkswagen with Swan 350. The quad can be seen on the tower on the left of the house.

me. But this time we really needed talking in. Sid's house is not easy to find; in fact, it is darned difficult to find.

Now I remembered that when Bob (DL4EP) had talked me in last year, he had mentioned where Sid's house was, but we had never seen it. Sid talked us in all right. Max drove my car while I operated.

Sid complained that my frequency was shifting. Not drifting – it always came back to the same spot – but didn't stay there. I had noticed this myself in reception. Naturally this was very worrying and, in fact, this worry was the only little disappointment in an excellent afternoon, where Sid's XYL gave us a lovely meal with a homemade cheese cake, which I will not forget in a hurry. Their home is fixed up beautifully with stereo tape recording and playing apparatus and every other modern convenience. Sid, by the way, is a veteran from Vietnam and so is his XYL. He was shot down in Vietnam and she nursed him back to health. That is where they met.

Well, to return to radio, I was sorry I had not brought the circuit diagram and the rig along, as Sid would have fixed it.

As a matter of fact, Max (F8TH) fixed it. We suspected all sorts of horrible problems. A zener diode regulator failure (that might have been difficult to cure; I had no spare zeners) – a vfo tube failure (that would have been easier, I had a spare), etc. It was so simple. The vfo tube was loose in the socket. I had carefully checked all the tubes, as I thought, but I missed this one! The manufacturer had thought of it and actually had spring clips to hold it in. But we had taken the rig in and out of the car every day and bumped it about the place a lot. And that was the only fault that developed. Naturally it was cured in a moment; we didn't even have to take the rig out of the case. The case has a lid which opens in just the right place.

We had a fine time mobiling, working a ot of French stations on 40 meters FØQH/M (mobile to mobile) on 20 meters both working on reciprocal licenses as he as DJ1GX when at home.

We worked WB2FNT, WB4KLM, WA3IWM, WB4FUT, and also ran into the Royal Signals net on 15 meters, working MP4TDE, MP4TDA, both in Sharjah, Trucial States, and 9M2DQ in Malaysia. The JAs were coming in well on 15 meters, and we worked JA1, JA3 and JA5 from the mobile on 15 meters, as well as VE6, TI2, and ZL1.

Max and I experimented with mutual interference by operating the two mobiles within a few yeards of each other on different bands, but caused each other no interference.

The hotel, by the way, had two separate television sets in different places, both in color, and a whole battery of antennas pointing in all directions to receive French and German television programs, as well as Luxembourg and Belgian programs. Only once did we cause any interference, and then we had mistuned something – otherwise we operated right through TV hours with no trouble.

Max is a tower of strength, helping me erect the antennas, or should I say erecting the antennas while I watched. Max is ex-French Navy and does everything neatly, tidily and efficiently, which is a good antidote for anyone as untidy as I.

Anno 1158 proclaims the notice in Beaufort Castle. The visitors are F8TH/M holding "Lobe de Beam," G3GID/M and ON4JF/M. All are members of Amateur Radio Mobile Society (except the dog!).

His XYL put up with an awful lot of amateur radio, and made it a most enjoyable party, as we did not concentrate too much on radio, but did a lot of sightseeing, including Vianden and Beaufort Castles and the Monastery at Clairveaux. And the dog "Lobe de Beam" kept us thoroughly amused.

We had another international party when I spotted a car with DL5UH on it. This turned out to be the old DL4UH (W6ECS) who had been the first arrival at the Verviers Rally in 1963 when we got our first reciprocal licenses. This time five nationalities gathered:

DL5UH (W6ECS) American; ON4JF Belgian; F8TH French; G3BID British; and LX1RK Luxembourg jointed the party, too.

All except LX1RK are mobile operators and, except LX1RK, all are members of the Amateur Radio Mobile Society.

This time I remembered my camera and took a photograph of the international gathering.

The end of the trip was approaching, unfortunately, and I had to say goodbye to Max and his XYL and "Lobe de Beam," who set off in their car for Paris, but not before Max had taken the first antenna down for me.

I stayed on a few more days and before returning home went on a shopping expedition to Bastogne to buy some *Pate de Sanglier* or *Pate of Wild Boar* or Wild Boar sausage, if I couldn't get the *Pate*.

The road rises to high ground at Heiderscheid, west of Ettelbruck before dropping into a deep gorge along the Valley of Sure.

At Heiderschied I contacted VE3CLO on 15 meters in a 3-way, and he gave me 5 and 6. I lost him in the deep gorge, but he carried on with the other station until I got out of the gorge and we continued the QSO to the frontier with Belgium. Here, I warned him to expect a change of call sign as I crossed from Luxembourg to Belgium, and I came up again as ON8ID/M on the Belgiam side, and as I got to Bastogne he gave me 5 and 9. So the rarer call of LX is not always worth a couple of S units!

Don (VE3CLO) proposes to put a mobile rig in a fiber-glass bodied car. I am most anxious to know how he gets on. It may well be difficult. But I hope he lets me know.

I repeated this journey next day to pick up the *Pate* they had kept in the fridge for me, on my way home via Brussels to London, so I thought I would try this for another nice long QSO while I drove from Heiderscheid (near Ettelbruck) to Bastogne.

15 meters didn't sound so good, so I switched to 20 meters and found GM5NW in Dundee and worked him right through the gorge to Bastogne. Again, of course, the change of call sign as I crossed the frontier, which always gives the other station some pleasure. I dropped from 5 and 6 at Heiderscheid to 5 and 3 at the bottom of the gorge, but was up to 5 and 7 at Bastogne.

I only signed with Ernie at Bastogne to park the car and collect my *Pate* of Wild Boar. I soon found him on the frequency as I called QRZ on leaving Bastogne for Brussels. I was soon joined by G3ASC in Oswestry and worked him all the way to Marche-en-Famenne, when I was called by DL9RC.

By the way, the roads here are really excellent. The new road from Bastogne through Marche to Namur is almost complete except for about 10 miles, and it is really good, and no longer goes through Marche but bypasses the town.

I had an appointment with ON4JF in Brussels, and here the talk-in again was really necessary and worked excellently. We had made a sked on 40 meters – we found each other at once, and I was guided right to his house. I spent a delightful couple of hours with him and then off on the Autoroute to Ostend. Armand kindly guided me in his car until I was on the right road.

From Ostend I made another few QSOs before closing down with the ON call and returning to Britain by the very comfortable, quick and efficient air ferry which flies you and your car from Ostend to Southend in England in 45 minutes. I was clear of Customs eight minutes after touchdown and driving off towards London.

The last three QSOs on this trip from Belgium were on 15 meters with WA9PFC, near Chicago; ZS1CS and G3AS. But G3AS was really too close and skip was wrong. He gave me 5 and 2 only.

. . .G3BID

Paul Schuett WA6CPP
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50 MEGAHERTZ DX

After I worked some fine DX on six this summer, I have come up with some conclusions to pass along to other VHF devotees:

It would appear that the band is open more than most of us suspect. The problem is that there is nobody around working the openings. Of course, there are lots of people *listening* – it's just that they are all sitting in the shack minding their own business without even knowing about the opening. Since most openings come to light when you hear some exotic contact making some noise, take advantage of the situation and make some noise yourself – so the other fellow can hear you.

The easiest way is to engage in a local QSO, but orient your antennas in various directions. Now and then I'll talk with a fellow eight miles away. Aligning the antenna on a precise aximuth for such a distance is not necessary (the signals are so good that they come in on the noise blanker), so one of us aligns the antenna northeast; the other southeast. We cashed in on this with a breaker from Albuquerque.

There is no need to run out of things to talk about, unless you are particularly boring yourself. Talk about anything – the weather (yesterday, today, tomorrow); articles in the current issue of *73* (if he doesn't have it, you can read the article to him); discuss paragraphs from the FCC Manual (it is surprising the number of people who have forgotten some of the rules, or at least don't use them consistently); practice code, or anything else. We had a 3-way round table that had a break-in from Colorado in this manner. When the other guy hears you, he will come in.

It's a good idea to use your VOX instead of PTT, since you can hear the breaker and not ramble on for another five minutes or so and miss the DX because of changing conditions.

Nobody to talk to? Then make a lot of noise every ten minutes or so. A CQ only takes one line in the log, and you might turn up something fascinating. A fellow from Texas heard my CQ one morning – neither of us had any idea the band was open.

The call CQ DX is silly. If any DX stations hear, you can be sure they will answer; they are as anxious to work double-hop as you are. Most of these calls end up with a local contact anyway, so we are back making noise, which will be picked up on an opening.

Be a gentleman when the band is open. It is amazing how many nice guys turn into fiends with sharpened teeth when the band opens.

1. Don't tune your transmitter on the working frequency. Move up a way; things won't change that much, and the rest of us won't have to work through the carrier.
2. Don't send on top of someone except to give your call. One fellow was calling CQ in CW on top of a DX QSO, making it impossible to hear the stations' IDs.
3. Wait your turn in a pileup. If someone else is transmitting, bite your fingernails until he's through.
4. Don't ragchew in a pileup. Others are waiting. Remember the Golden Rule. Ragchew when it is apparent everybody around has checked in and you have a roundtable going.

My first Ohio contact was marred by somebody hollering *INTERFERENCE INTERFERENCE INTERFERENCE . . .* " all the way through the 4-minute QSO. If this guy has a gripe, let him get on the air and tell me – I'll apologize. Meanwhile, like the rest of us, such a person should simply wait his turn, then give the desired station a call.

These suggestions have been successful in detecting elusive 6-meter openings. Let's not sit around listening – let's make some noise to let the DX know we're around.

. . .WA6CPP

Herbert S. Brier W9EGQ
c/o 73 Magazine
Peterborough NH 03458

Questions Questions Questions

I use a Globe Scout 680 transmitter in the 40-meter Novice band. All but one of my seven crystals have bad keying chirps; therefore I am limited to one frequency. I would buy more crystals if that would solve the problem, but one out of seven is not good odds. What do you suggest? Possibly one of the crystal manufacturers might be willing to inspect your non-chirper and attempt to grind you other crystals with the same characteristics. But such custom crystals would probably be quite costly. A more promising approach is to modify the transmitter slightly for improved keying. The following suggestions apply to any cathode-keyed CW transmitter:

Temporarily disconnect the oscillator cathode circuit from the key jack and ground the lead. You now have straight amplifier keying. If this does not cure the chirp, try regulating the oscillator screen voltage by cutting in half the resistance of the screen dropping resistor and connecting a 150V voltage regulator (OA2) between the resistor and ground. Also regulating the oscillator plate voltage is desirable.

Once the amplifier can be keyed without chirp, transfer the chassis end of the oscillator grid resistor to the cathode terminal of the oscillator tube socket. Next insert a 50Ω, 10W resistor between the ungrounded terminal of the key jack and the rest of the keying circuit. Finally, connect a 10 μF, 450V capacitor from the cathode side of the resistor and the transmitter chassis.

When the key is first closed, both the oscillator and the amplifier immediately turn on. When the key is opened, the amplifier immediately turns off, but the oscillator hangs on until the added capacitor charges through the tubes sufficiently to turn it off. At normal keying speeds, the oscillator will continue to function during the spaces between dots and dashes in a letter, but it will drop out during longer pauses. The result is chirpless amplifier keying combined with automatic oscillator shutoff during keying pauses. The length of time that the oscillator stays on after the key is released depends upon capacitance of the added capacitor in the cathode circuit. The 10 μF specified is a good compromise value for most operators.

The nearest water pipe to my radio room is far across the house. Another amateur told me that a 2-ft long, concrete-reinforcing rod stuck in the ground was all the protection I needed against lightning. But I still feel nervous depending on that 2-ft piece of metal sticking out of the ground to protect my equipment and me against lightning. Should I be? I would be nervous, too! The National Fire Code specifies that, to be a

suitable protective ground electrode, a water pipe should be buried in the earth at least 10 ft deep. It follows logically that a driven ground rod should penetrate the earth to the same approximate depth. A ¾-in. water pipe or a 5/8-in. solid rod is suitable. Drive it into the ground where the shortest direct connection between it and the lightning switch or arrestor installed at the point where the antenna enters the house can be installed. The fire code suggests a No. 4 or larger ground conductor for transmitting antennas and a No. 10 or larger conductor for receiving antennas.

On 80 and 40 meters, there are images every 16 or 17 kHz across the dial of my SX-101A receiver. How can I get rid of them? These spurious signals are easier to identify than to eliminate. They are undoubtedly harmonics of the 15.75 kHz horizontal sweep signals of nearby television receivers. Try turning off all the nearby TV receivers that their owners will let you touch to see if the interference disappears. If you discover the culprits (there may be several of them in an apartment house), check with the sellers or manufacturers. The problem is not unknown to television receiver manufacturers, and their service departments can often supply suggestions and components for use by television servicemen in reducing the spurious radiations to FCC standards. The radiations may come from the TV receiver antenna, or its power line, or directly from components on the chassis. Improved shielding and lead dress, and better filtering of power leads are standard remedies.

At your receiver, the spurious signals could be getting in via the power line or by

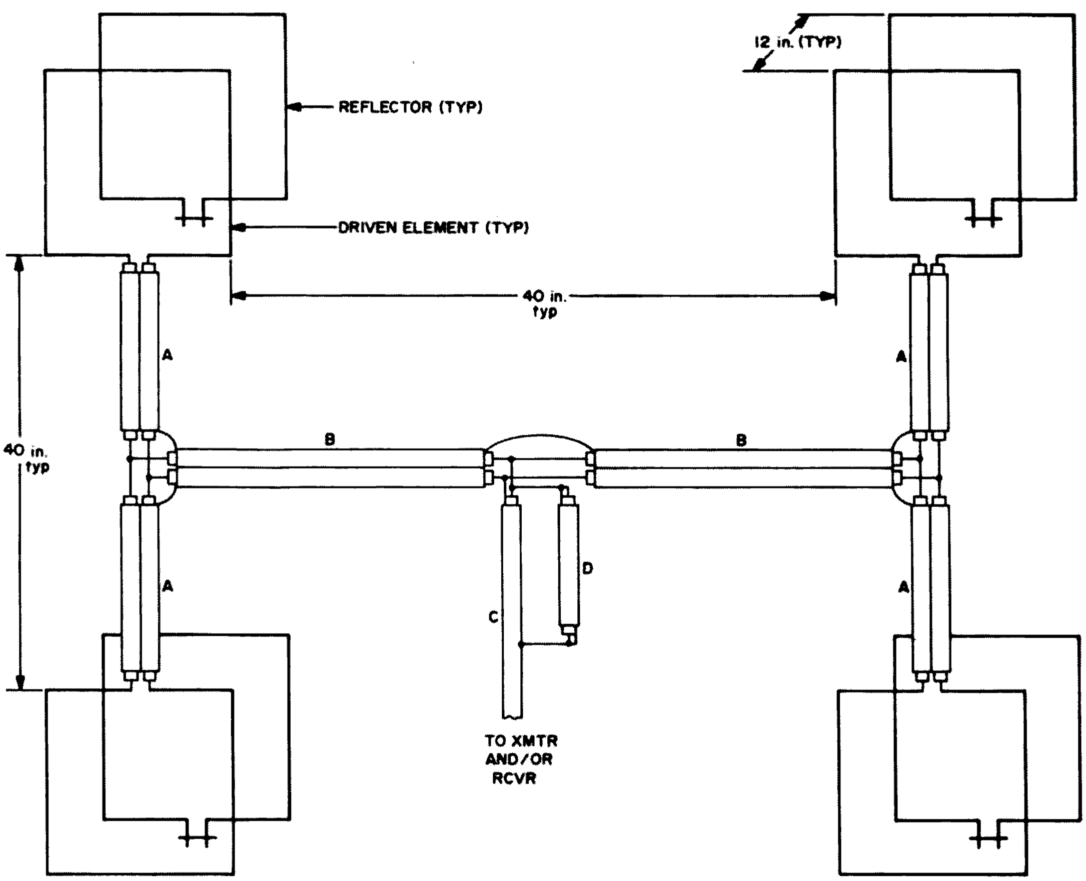

Fig. 1. Note: Solder all adjacent coaxial cable shields together, except top of feedline (D) and top of balun (C). Data on phasing harness – Frequency: 144.5 MHz. Decrease suggested lengths ¼ in. for each 1 MHz increase in frequency. A – 4 pair 75Ω, solid polyethylene insulated coaxial cable 41-5/16 in. long (¾ wavelengths). RG-11A preferred. RG-59A usable. B – 4 pair 75Ω, solid polyethylene insulated coaxial cable 53-13/16 in. long (one wavelength). RG-11A preferred, RG-59A usable. C – 75Ω coaxial transmission line. D – 19-¼ in. length (¼ wavelength) of same type of coaxial cable used for main transmission line. Inner and outer conductors shorted together. Use epoxy of similar low-loss cement to waterproof connections. Radiator and reflector loops 20 in. per side, 8 in. tuning stubs in bottom sides of reflectors.

direct pickup, but the most likely path is the antenna. The latter possibility is easily tested. A horizontal receiving antenna fed with coaxial cable and located as high and far away as possible from the source of interference is usually less susceptible to TV birdies than end-fed wires and most verticals, simply because the latter two are usually close to the source of the interference.

How can I use coaxial cable in place of 300Ω TV ribbon in the phasing harness of the 144-MHz, 4-bay quad antenna described in the 1971 ARRL Handbook without unbalancing the system? I am sure that a coaxial harness would be more stable in wet weather than the 300Ω ribbon is. The coaxial phasing harness is sketched in Fig. 1. Basically, each length of 300Ω line in the original harness is replaced by two lengths of 75Ω coaxial lines beside each other. Their shields are connected together at each end, and their center conductors are connected into the system just like the corresponding conductors of the 300Ω line. Because standard polyethylene-insulated coaxial cable has a velocity of propagation (VP) of .66, compared to a VP of .82 for the 300Ω ribbon, the lengths in the new harness are approximately 20% shorter than in the old one. Also, a 1:1 balun, instead of a 4:1 balun, is used where the main transmission line is connected to the center of the phasing harness. The phasing harness can be constructed of either RG-59A or RG-11A cable – the former being easier to work with and the latter giving slightly lower losses. In either event, RG-11A is strongly recommended over RG-59A for the main feedline, unless the line is very short. Note that the element spacings in the individual 2-element quads in the original ARRL design were apparently chosen to produce a 75Ω feedpoint impedance. If the individual quads were of the 3-element type, the feedpoint impedance would probably be closer to 50Ω than to 75Ω; in which event 52Ω coaxial cable throughout the system is recommended.

Keep your questions short and address them to: *Questions, 73 Magazine, Peterborough NH 03458.*

. . . W9EGQ

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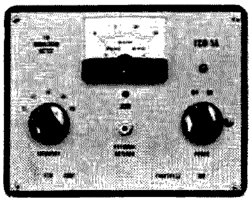

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When Heathkit offered the 10-103 oscilloscope kit with its 10 MHz bandwidth and triggered sweep at a price I could just argue myself into, I found some precious pennies and quickly sent them off before I could change my mind. The resulting instrument with its calibrated vertical attenuator and triggering which proved to be positive beyond the useful response of the vertical amplifier was very satisfactory for my experimenting. The only disappointment was in the limited choice of calibrated horizontal sweep speeds. Seven sweeps in decade steps covered 100 ms/div to 0.1μ/div. Those of you who are familiar with industrial oscilloscopes will appreciate the restriction this forces on the operator.

Let me illustrate the problem. The horizontal sweep is set at 100 μs/div. and ¾ of a pulse is displayed. In order to see the complete pulse you must change the sweep speed and the nearest slower speed is 1 ms/div. In addition to the complete pulse you will also see 6½ more pulses of the pulse train as well. The resolution has been lost. You could use the variable sweep control but then the calibration would be useless for any accurate time measurements. What is needed is a calibrated sweep of 200 μs/div. A similar situation arises when three pulses are displayed at 100 μs/div. and you want to get maximum detail of one pulse. You need a sweep speed of 50 μs/div but you only have a sweep speed of 10 μs/div which would display only 3/10 of the pulse.

Adding ten more calibrated sweep speeds may sound like a formidable undertaking but really all you need is one more 10 KΩ 1% resistor and a two pole three position switch!

Basic Design

Let us look at the basic sweep circuit in Fig. 1 (the designations are Heathkit's). It is a PNP transistor using a basic characteristic

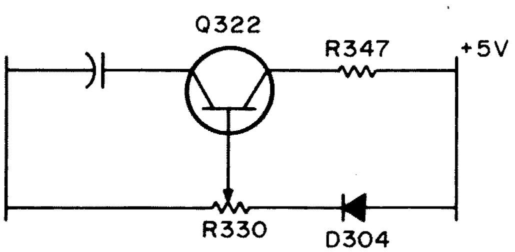

Fig. 1. Basic Sweep Circuit.

of a transistor. The collector current is nearly equal to and controlled by the emitter current. The voltage on the base of the transistor is held constant by the bias resistor R330. This will cause Q322 to conduct until the voltage across R347 is equal to the voltage across the bias resistor from its wiper tap to the cathode of D304

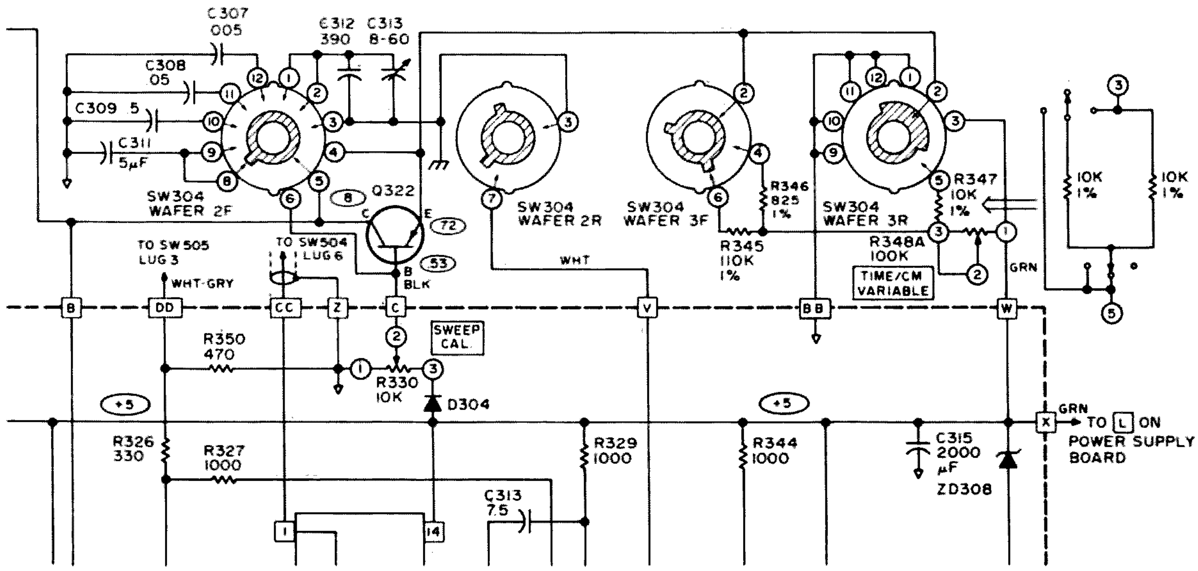

Fig. 3

(the diode mirrors the base-emitter voltage for temperature stability). By ohm's law, if this voltage is held constant and the resistance of R347 is held constant, then the emitter current must be constant. It follows then that the collector current will be constant as well and can be used to create a linear sweep voltage.

Let us look at the capacitor charging formula. I/C = change of volts/time. The change of volts/time is our linear sweep. The capacitance will stay constant so the charging current is the only parameter to change to give us a new sweep speed. Going back to our discussion of the basic sweep circuit we see that R347 controls the charging current. Thus to double the charging current and thus the sweep speed we must *halve* the value of R347. Similarly, to halve the charging current and thus the sweep speed we must double R347. With this knowledge we take our two pole three position switch and two 10 KΩ resistors and combine them to make a new R347.

Heathkit has used 10 KΩ for all but two of the sweep currents, changing decade ranges by changing the sweep capacitor. For the desired sweep speeds we will need an R347 of 5 KΩ 10 KΩ and 20 KΩ. The 5 KΩ can be fabricated by paralleling the 10 KΩ resistors, the 10 KΩ resistor is supplied, and 20 KΩ can be fabricated with two 10 KΩ resistors in series. This sounds like five precision resistors but a switch is necessary regardless so it can be used to make up the various values. Now only one more precision resistor must be acquired. The resistors and switch wired as in Fig. 2 will replace the original R347 in the sweep circuit.

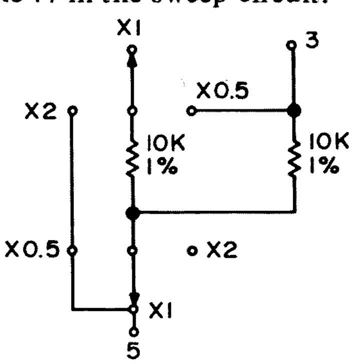

Fig. 2. Modified circuit to replace the R347 in the sweep circuit in Fig. 1.

In use the original decade selector chooses the correct capacitor for the desired decade, then the new switch will choose the multiplier which will give the sweep X1, X2, or X0.5.

When buying your switch be certain to get one small enough to fit in the available panel space beside the decade switch. As a small finishing touch, spend the few extra cents to buy the Heathkit H2 pointer knob and its insert. The result will be an IO-103 which appears at first glance to be unmodified but which holds the advantage of ten more calibrated sweep speeds.

. . .McCarthy

E. R. Davisson K9VXL
83 Crestview Drive
Greenwood IN 45142

MONO REPRODUCER

Want a foolproof circuit? Here's a circuit which is as close to the "guaranteed to work the first time" type as anyone can possibly approach. Considerable care was exercised in the design of this circuit to eliminate most of the errors often committed by builders of circuits from magazines. What does it do? As the name suggests, it will reproduce *anything* at the output jack J_2; be it dc, rf, or any waveform, exactly as put into the input jack J_1.

How many times have you decided to build a circuit from a magazine only to find you either didn't have the correct parts, or the parts were too expensive, or not available in your area? Or your possible substitutions weren't close enough in value to be usable? Or how about the authors who neglect to tell you that the circuit requires a special piece of test equipment owned by only five or six companies in the world?

Really disgusting, isn't it? I know. I personally have a rather large box of assort-

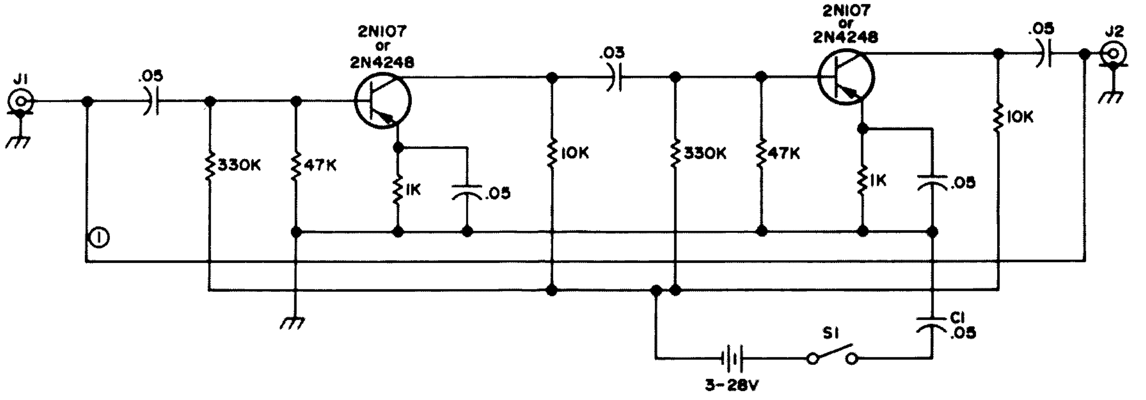

Fig. 1. Schematic diagram of the mono-reproducer.

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ed partially completed projects which need only a part or two to finish. Of course, there are some I completed, but the results weren't as I expected.

But now, back to this exceptional circuit. Construction details have been left up to the individual's own choice. Your case may be precision built made out of special alloys or may be just a cardboard box.

Don't worry about little things like component tolerances. Parts may vary by as much as several hundred percent and the circuit will still perform adequately.

You've just checked and found out you only have one good NPN transistor and one old shorted PNP on hand. Okay, go ahead and use them both. They'll work all right. Matter of fact, if you don't have any transistors, it's still okay as the circuit will still accomplish the same result, i.e., what goes in will come out unchanged and unmodified. An added bonus is the extremely low power drain from the battery (battery may be expected to last for its normal shelf life).

How have we accomplished all this? Well, that gets down to the secret of the circuit. Notice the careful placement of capacitor C_1. Make sure this part is not shorted (however, the other capacitors in the circuit may be shorted). Its placement insures long battery life.

Now notice the large (1) next to the input jack J_1. This is the feedback lead from output to input and is really the most important connection for the success of the circuit. The size of this wire should be as large as possible. (Notice how no electronic components have been used in this feedback path to interfere with performance.)

The next time your homebrew project doesn't work as the author claimed it would, remember this circuit and give it a try. You'll be glad you did; you will have restored your faith in homebrew projects. Imagine your pride when you show your friends your mono-reproducer and watch their amazement as you put a signal in and actually get the same one out unchanged and unmodified with no power having been consumed.

. . . **K9VXL**

Charles O'Hare WA8DEB
Box 161
Carroll OH 43112

Low Power 6 Meter AM Transmitter

This article is for the low power enthusiast and describes a 6-meter AM low power transmitter running about 90 mW output.

The OX oscillator produced by the International Crystal Co. is used as the oscillator stage. The output from the oscillator is applied to a transistor amplifier, increasing the output to about 90 mW. As can be seen in Fig. 1, the transistor amplifier is of straightforward design and there should be little difficulty in duplicating it. However, when testing the transmitter, a milliammmeter should be placed in the collector battery lead of the amplifier, to monitor collector current. Should the collector current exceed about 20 mA or continue to rise above that value, remove power immediately to prevent transistor damage and check base-emitter connections. I mounted my rf amplifier on a homebrew printed circuit board having the same dimensions as the OX oscillator. The modulator employed in my transmitter is described in the ARRL VHF Handbook, page 151 of the First Edition. A conflict of voltage polarity existed between the transmitter and the modulator and individual batteries were used for each.

Tuneup

Tuneup is accomplished by attaching a 6-meter antenna to the transmitter. A length of wire is attached to the antenna jack of a 6-meter receiver. This wire should be long enough to give an indication on the receiver's S-meter with the transmitter turned on. L1 is adjusted for maximum S-meter reading on the receiver. Set the audio gain control on the modulator for the desired audio as monitored on the receiver. With the tuneup complete the rig is ready to go on the air.

The QRP rig was put on the air upon completion and replies were received to my first several CQs. The greatest distance worked thus far has been approximately 40

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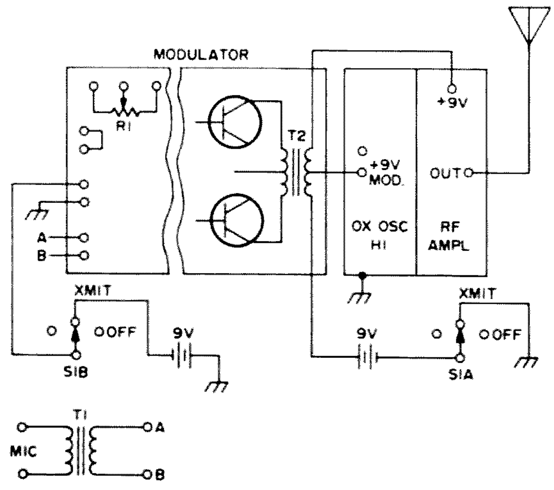

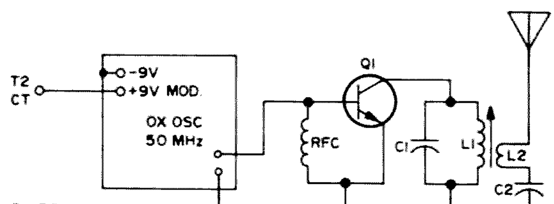

Q1-RCA SK 3019
MODULATOR-LAFAYETTE CAT NO. 99E90375
C1-22 pF R1-470 TO 820Ω (Select for desired voice level)
C2-50 pF OSC-INT. XTAL "OX" SERIES HI FREQ.
L1-10T NO. 22 AWG ENAMEL ON 1/4 in. DIA. CERAMIC SLUG TUNED FORM.
L2-2T NO. 22 AWG ENAMEL ON BOTTOM (COLD END) OF L1.
T1-MIN. MIKE XFMR-LAFAYETTE NO. 99E60345.
T2-MIN. MOD. XFMR-LAFAYETTE TYPE AR/62.

Fig. 1. Modulator – Lafayette Cat. No. 99E90375. Parts: Q1: RCA SK3019; C1: 22 pF; C2: 50 pF; RFC: Z-50; L1: 10T No. 22 enamel on ¼ in. iron core, ceramic slug tuned. L2: 2T No. 22 enamel on bottom L1; T1: miniature microphone transformer (Lafayette 99E60345); T2: miniature modulation transformer (Lafayette type AR162); S1: 2P3T; OSC: International Crystal OX osc. Series HI freq.; R1: 470–820Ω. Select value for desired voice level.

miles with an S-9 signal. The QTH is located in a poor VHF location so the results are more than satisfactory. The transmitter has not been on the air during skip conditions, so we are waiting for an opportunity to give it a try. This transmitter is on the air nightly and local contacts are routine. Remember, when using QRP power the choice of frequency and the band activity is important in making contacts. We have been very successful in making contacts when the band is quiet or when very few stations were on. We have had our greatest success later in the evening. If your interest is low power, give this little rig a try. The cost is small, and the results are exciting. Good luck in your QRPing.

. . .WA8DEB

John J. Schultz W2EEY/1
c/o RLC Inc.
30 East 42nd St.
New York NY 10017

Inexpensive RF Speech Clipper

Rf level speech clipping for SSB transmitters, where the SSB signal is clipped and then refiltered to remove distortion products, is generally conceded to be the most effective type of speech processing that can be applied to a SSB transmitter. This system is employed in the more expensive amateur equipment designs as well as in many military and commercial SSB designs instead of simpler audio compressor or alc circuits. Material has been written before on the building of such clippers as accessory item or modifying existing transmitters for rf speech clipping. The main drawback to such designs, particularly those intended as independent accessory items to a transmitter, has been the expense involved because of the need to use two sideband filters of either the crystal or mechanical type. The cost of the necessary filters alone could run to $70 or more if new filters were purchased.

This article presents an rf speech clipping unit which can function as a completely separate accessory item for use with any SSB, AM or FM transmitter, has 99% of the performance capability of the more expensive designs but yet can be built for a total cost of $20 – 30 including the necessary filters. One can also still use an available speech compressor as part of the unit if such a unit is available and one now wants to upgrade the speech processing used to include rf speech clipping.

Basic Unit

The basic functions of the rf speech clipping accessory unit are shown in block diagram form in Fig. 1. It consists of a basic SSB generator as would be found in any SSB transmitter. The SSB signal is formed by the sideband filter following the balanced modulator. The signal is then amplified, clipped, and again amplified. A second sideband filter is then used to pass only the original sideband signal and remove the spurious signals generated during the clipping process. The filtered signal is then demodulated by a simple ring diode demodulator and is audio fed into the microphone input of any transmitter.

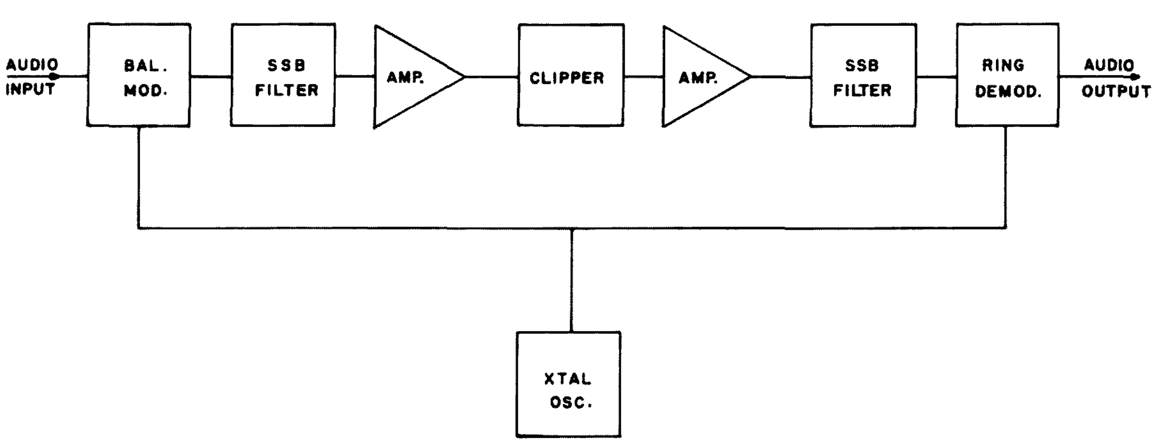

Fig. 1. Block circuit diagram of rf clipper unit. Use of various modules and diode array packages considerably simplifies construction.

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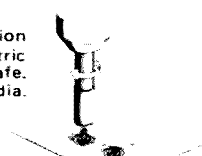

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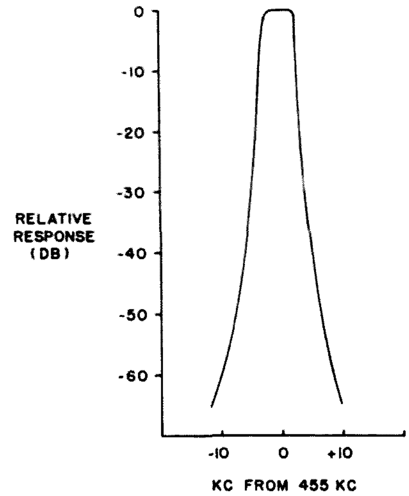


Fig. 2. Response of Amperex 2422 540 50021 crystal filter. Response is not perfectly symmetrical, especially at high attenuations.

The system works effectively because clipping of the SSB signal at an rf level produces far less distortion products than if the audio signal were directly clipped. A hard clipped audio signal cannot, in fact, be fed into an SSB transmitter because the transmitter cannot reproduce the square wave form of a hard clipped audio signal. In-band audio distortion products are still present with the rf speech clipper system but remain at a reasonable level, at least for speech transmission.

Various shortcuts have been tried to get away from the double sideband filter requirement shown in Fig. 1, but without any great success. A second sideband filter is absolutely necessary or the demodulated audio signal will be greatly distorted. The use of one "good" sideband filter and a broader, less expensive type for the second sideband filter or just a simple low-pass filter in place of the second filter also produces too much distortion.

The secret, obviously, to building such a clipping unit at a reasonable cost lies in finding sideband filters which deliver acceptable performance at a low price. The author found such filters in the form of Amperex (35 Hoffman Ave., Hauppauge NY 11787) 455 kHz i-f crystal filters. These filters are miniature, inexpensive ($5 –6) crystal i-f filters employing three crystal elements, input and output transformer coupling, etc. The internal circuitry is not so important, however, as to look at the selectivity charac-

teristic of these filters, as shown in Fig. 2. The filter has practically no ripple in its passband and reasonably good skirts, although the attenuation characteristic is not symmetrical at very high attenuation values. The bandwidth, if the carrier oscillator is set at the usual – 20 dB point on one side of the filter response, is about 6 kHz. Such a filter used alone as the sideband filter in a transmitter would not be suitable because of its bandwidth and lack of steep skirts. However, for use in an rf speech clipper accessory where the sideband signal is again demodulated to audio in a closed system, the filter's characteristics are adequate. The filters are relatively new on the market and if they are not available locally, one should inquire directly of the manufacturer for distributor information. The manufacturer may even be inclined to assist in obtaining the filters at reduced cost if one indicates that they are being used for amateur radio purposes in circuits which utilize the filters' unique characteristics. The filters are the "sharpest" ones which the manufacturer currently produces and are rated as nominal 4 kHz bandwidth units designed for narrow band AM reception.

Practical Circuitry

Besides the use of the filters just de scribed, the practical circuit of the rf clipper unit makes use of another inexpensive item commercially available from any major mail order house. This item is the Miller 8902-B i-f amplifier module which also sells for about $5. With the use of this item, the relatively complex looking block functions of Fig. 1 reduce to basically a simple interconnection of various modules as shown in Fig. 3. The diode balanced modulator can either be separate diodes (IN63 or similar) or a diode array such as the RCA CA-3019. This array provides sufficient matched diodes for both the balanced modulator as well as for the rf clipper diodes at a low total cost. It has the advantage of providing somewhat better modulator performance than separate diodes because each of the diodes in the CA-3019 are inherently matched. The carrier oscillator is a simple conventional circuit where the collector output circuit is broadly resonated by the tank circuit consisting of the 220 μH choke and 630 pF capacitor. The circuit will work well with any standard 32 pF crystal and this fact plus the relatively soft skirts of the sideband

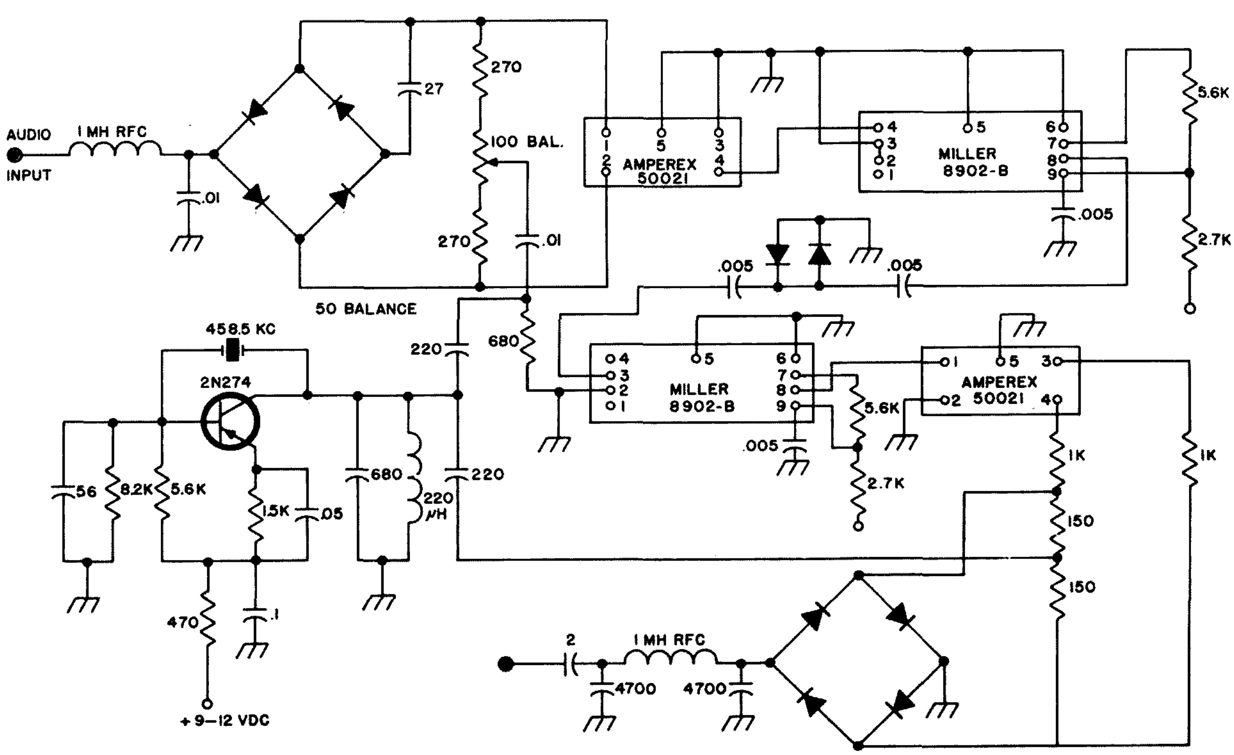


Fig. 3. Wiring requires little circuit construction; mostly just interconnection between i-f modules and filters. Separate diodes such as IN64 or IN914 can be used but use of RCA diode array CA 3019 containing six matched diodes on one chip is recommended for the balanced modulator.

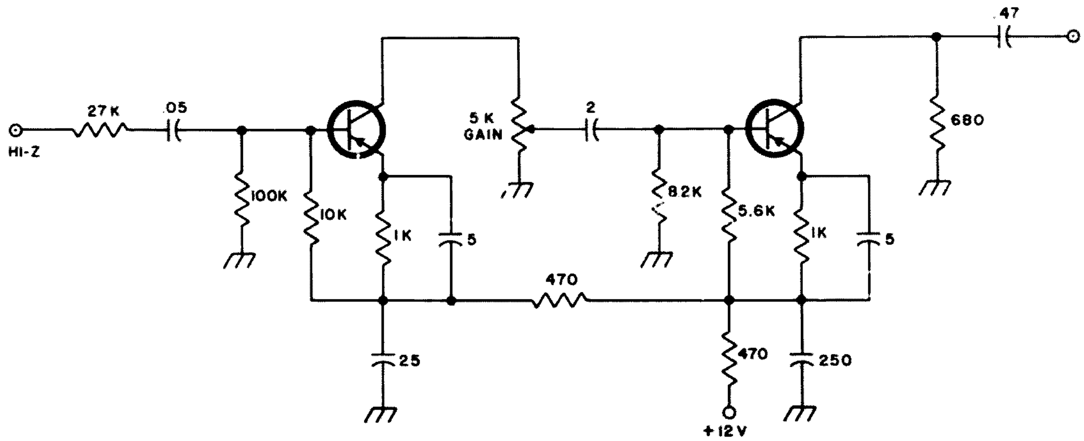


Fig. 4. Audio preamplifier for HI-2 mike having shaped communications response. Transistors are 2N466 of HEP254.

filter eliminate the need for any frequency adjustment circuit for exact oscillator output frequency.

The audio input to the balanced modulator can be supplied from the output of an existing speech compressor. Most compressors will have more than sufficient output level to drive the balanced modulator. In case one doesn't want to use this approach, a simple separate audio amplifier can be built as shown in Fig. 4. Also, any one of the great number of microphone preamplifiers available on the market in kit or module form can be used to drive the modulator. The rest of the circuitry is just the interconnection of the i-f amplifier modules and the sideband filters. The diode clipper circuit is placed between the amplifier modules. Separate diodes as shown in Fig. 3 can be used but, again, it is advantageous to use the diodes available on a diode array such as the RCA CA-3019 because of their matched qualities. The emitter-base junction of certain transistors, such as the 2N3702, also make excellent diodes for clipping purposes. The product detector for the final SSB signal after the second sideband filter is a diode ring demodulator, the injection voltage being supplied by the carrier oscillator for the balanced modulator. Again, either separate diodes or a diode array can be used, although in the case of the demodulator, the use of matched diodes is rather unnecessary. The slight distortion produced by unmatched diodes, considering the overall distortion products in the rest of the system is insignificant.

In Fig. 3, connections are shown being made to a pin 8 on the i-f amplifier modules. The modules as purchased do have a pin 8 but it is not connected internally. A very slight bridging connection must be made internally in each module as shown in Fig. 5. If one carefully examines the underside of the module wiring, which can be easily exposed by lifting the cover via bending of the cover tabs, a solder line will be found to go by pin 8. This solder line connects the "hot" side of the link output on the last i-f transformer within the module to the built-in AM detector diode in the module. The solder line can be easily found by also seeing how the diode is wired in on the top of the module board. A circuit diagram is supplied with each module and tracing of the circuitry is relatively simple. In any case, a simple solder bridge is made from pin 8 to the above described solder line.

Construction and Adjustment

Construction of the unit can be made on simple perforated board stock. The photograph shows my construction. In this case, three small (about 4" x 2") boards were used. One contained a speech compressor. That shown contains the balanced modulator, carrier oscillator, first sideband filter and first i-f amplifier module. The third board contained the clipper diodes, second i-f amplifier, second sideband filter and the product detector (ring demodulator). All three boards should be contained in a small metal enclosure. There is no particular layout of parts required, except to keep the

various rf leads as short as possible. Be sure that the filter cases are grounded (center solder pin) and that the i-f amplifier module cases are grounded (solder to one of the case tabs). A somewhat awkward arrangement of trimmer capacitor is shown in the photograph. Two 25 pF trimmers were connected in parallel to duplicate the single 50 pF unit shown in the schematic for the balanced modulator capacitive balance. Two other trimmers were used in the crystal oscillator circuit which proved completely unnecessary and are not shown in the schematic.

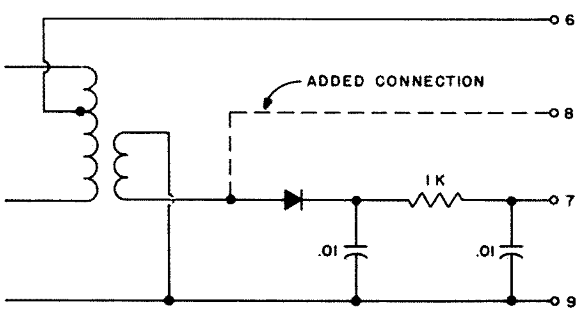


Fig. 5. Minor modification is necessary to Miller 8902-B i-f module as shown. Pin 8 is normally not used.

A HC-16/V type crystal is shown but this type of crystal cut to the carrier frequency required is expensive. An FT253 holder crystal will function just as well, of course, and a particularly good value can be found in this type of crystal from JAN Crystals. They will supply such a crystal cut to any frequency desired in the 350 – 500 kHz range for just $1.75 plus postage. This larger crystal holder can be soldered directly on the perforated board without any need for the crystal holder.

Adjustment of the unit is quite simple since only the carrier balance controls (resistive and capacitive) require adjustment. The easiest way to accomplish the adjustment is to listen to the SSB signal on a receiver before the clipper diodes. Without any audio input, the 100 Ω carrier balance potentiometer and 50 pF balance control are successively adjusted for minimum carrier level. If available, a sensitive voltmeter with rf probe can also be used to make the adjustment. An audio test input is then applied and the SSB signal before clipping checked for clarity. The signal then can be checked after the product detector by feeding it through any available audio amplifier system. The clipping circuit should not normally require any adjustment. If the clipping, however, sounds too harsh or distorted, a 10K potentiometer can be added before the clipping diodes to regulate the signal level feed to the diodes to a value which provides the best sounding final audio. The i-f amplifier modules as well as the sideband filters have screwdriver adjustments on top for the i-f transformer which are a part of each unit. These transformers should not require adjustment unless somehow their factory adjustment was changed. If one trys to touch up these adjustments, do so for maximum signal level output from the product detector while listening that the final audio output does not become distorted. Rather than using an audio signal generator, the audio output from a small radio tuned to a local broadcast station makes a good audio test signal source.

Summary

The rf speech clipper described can be constructed relatively inexpensively and will provide very good results. It is difficult to assign a definite dB value to the improvement in transmission capability that an rf clipper provides. Numerous tests have shown that such a speech processing method is superior to other forms. The unit described was tried, using the same equipment setup, against equivalent types of processors using more elaborate components and techniques. Under difficult QRM conditions, it provided as much an apparent signal intelligibility increase as any other unit. When signal levels improved, its distortion became apparent sooner than that of units employing, for example, two mechanical filters for sideband filtering. Distortion in this case means only distortion within the passband of the transmitter being used and not a broadened signal. Therefore, used when appropriate under difficult conditions, the clipper did prove to be one of the most useful accessory items that one could devise for use with a transmitter versus dB's gain per dollar of expenditure.

. . .W2EEY

Ann Lemert
2224 Sandra Court
Lexington KY 40504

PROFESSOR BEAMS SPECIAL LECTURE TO CLASS

When Durward Olds bought his first radio kit, he intended to build the combination shortwave and standard broadcast set only as a sort of test run. If the set worked, he planned to get another for his 12-year-old son to build.

The set worked. And just last winter, Doc Olds WB4GNL conducted what may be the first classroom lecture delivered by ham radio. Dr. Olds is professor of animal science at the University of Kentucky in Lexington.

The lecture was given at the invitation of Arlo F. Shelley K7KNQ, biology and physics instructor in the little town of American Fork, Utah. Dr. Olds accidentally contacted Shelley one week end, and before their visit ended, found himself scheduled as "guest lecturer" the following week for Shelley's high school biology class.

"I wasn't sure at first he was serious about the invitation," Doc recalls. "Moving radio equipment and antennas to the school would be a real chore."

The lecture, "Reproduction and Artificial Insemination of Farm Animals," was broadcast from Dr. Olds' wood-panelled ham shack in the basement of his home. Written especially for this class, the 50-minute talk included some material Dr. Olds has used when addressing university freshman classes.

Shelley relayed questions from the class at ten minute identification intervals, and again at the conclusion of the lecture.

"I was quite impressed by the questions these students asked," commented Dr. Olds.

Besides the students, the audience in Utah included the school principal, a newspaper reporter and a professor from Brigham Young University.

Five years ago, Dr. Olds asked a colleague in the dairy science department at the university to recommend a Christmas gift, ". . . something electronic," for his son to build. The friend, Wally King WA4NNZ, suggested a radio. Dr. Olds chose a $40 combination shortwave and standard broadcast kit from a catalog.

"I was delighted when it worked!" he recalls. "For about a year, I listened to ham broadcasts, whetting my enthusiasm."

"Prodded by his friend, Doc got his license in 1967. He earned the General license in 1968 and moved up to Advanced status in 1970.

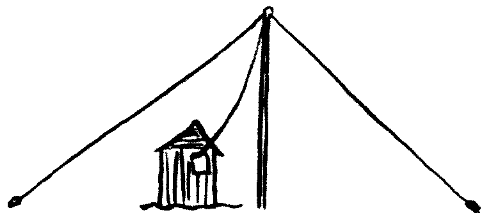
Doc WB4GNL of Lexington, Kentucky, in his shack. (Photo by Ab Lemert.)

That first set led to others, including a transceiver he built for a former student (Oliver TI3OD) who moved to Costa Rica three years ago and teaches animal breeding there. They have maintained a weekly schedule since.

Dr. Olds' son may have inspired that original radio kit purchase, but it was the father who has been hooked by a hobby he finds both stimulating and relaxing.

. . .Lemert

H. W. Lufkin W0SII
1219 Racine Street
Aurora CO 80010



MY FAVORITE BAND

My friends' ham shack was located in a large room adjoining their hardware store, and what a ham shack it was! The first thing that caught my eye was the huge transmitter, which completely filled one end of the room from floor to ceiling and from wall to wall. "This," said my friends, "is a home built, one kilowatt phone transmitter, with a pair of 849 tubes in the final amplifier, modulated by another pair of 849s." After answering some of my questions about their "homebrew broadcast station," my friends proceeded to turn on several switches on the transmitter, and then, with a lead pencil attached to a long insulated rod, struck some of the biggest, brightest, and noisiest arcs from the final stage tank condenser that I had ever seen! Perhaps my face showed my thoughts, or maybe my friends merely made a guess, but they gave me the microphone with the invitation to "Call a CQ or two." The CQ call I gave that day must have betrayed my excitement and inexperience, but an answer came quickly from a station in Illinois, warmly welcoming me to the 80 meter phone band.

The friends responsible for my first 80 meter QSO were Ray and Leo W9BXC of New Prague, Minnesota, and the year was 1934. Since that day in 1934, and even though I operate on several other bands, 80 remains my favorite. It was 1948 before I put a kilowatt of my own on the air, but by then high power was quite common, and it has never given me the thrill that the first QSO with the W9BXC kilowatt produced so many years ago.

Very often one hears the remark that 80 meters is an "old man's band," and that it is good only for round table QSOs or handling local message traffic. In answer to these statements, first let me say that 80 meters doesn't have any more "old men" on it than any other band, with the possible exception of the Novice bands, and furthermore, the term "old man" is much better expressed by the words "old-timers.' It might be well to remember that whether you've been licensed for as much as fifty years, or as little as fifty days, you're an "old-timer" to the fellow

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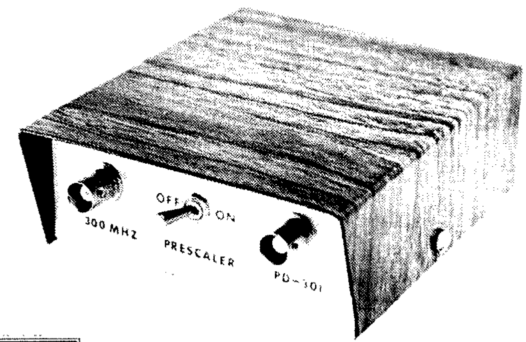

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who got his license after you did. Secondly, although 80 meters is generally considered to be a good band for round table QSOs, and traffic handling, it is also one of our better DX bands, especially during the hours of local darkness.

The question is often raised as to just what the best antenna is for 80 meter DX work. The answer to this question will depend largely on what the particular amateur concerned can provide in the way of a mast, or supporting structure; an area, or space in which to erect the antenna; and the muscle power to complete the installation. These 80 meter antenna systems range in size and complexity from a simple "inverted V" 10 or 12 meters above ground (such as the one Gus Browning and I put up for his operation as W4BPD/LX) to the two element 80 meter cubical quad, 80 meters above ground at the QTH of Bob W5KFD in Houston, Texas.

It has been noted long ago that an effective 80 meter DX antenna is the semi-vertical type, and the quarter wave length vertical, or combinations of phased quarter wave length verticals are very good DX antennas also.

I have not mentioned any form of horizontal antenna in connection with working 80 meter DX. The antenna must be one which provides a low vertical angle of radiation to be effective for DX work. This fact rules out the horizontal antenna unless it is erected approximately ½ wave above ground. Oh yes, you'll hear stations that manage to work some DX with a horizontal doublet only 10 or 15 meters high, but their DX signals will never be comparable to those of the stations with the low angle DX antennas.

It is always very difficult to put a value on how much a given station's antenna contributes to his signal, but I'd say that a ratio of 80 per cent antenna to 20 per cent power seems to be about right. I personally find I can work my share of DX on 80 with a power input of 100 to 200W.

If you don't operate 80 meters now, give it a try and find out how much fun you're missing. Like I said, it's my favorite band and it could be your favorite band too, once you get your feet wet.

. . .WØSII

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THE AUDIO BISHOP

The Bishop noise limiter has proved very effective for CW and SSB reception. Series-type audio limiters usually function poorly with these modes. The Bishop circuit is connected across the primary of the last i-f transformer (Fig. 1), and with 455 kHz or

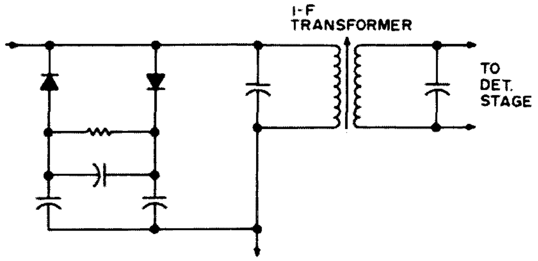


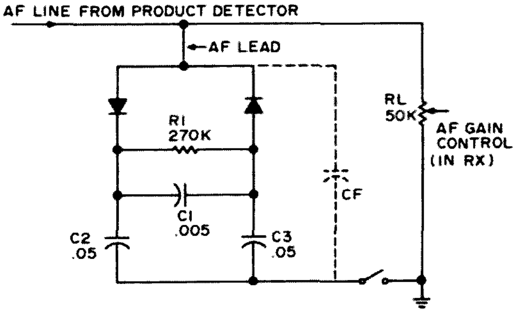
Fig. 1. The Bishop i-f noise limiter.

lower frequency i-fs, only a slight retuning of the primary winding is needed to compensate for stray capacitance.

With higher frequency i-f's in the range of 5 to 9 MHz, detuning of the primary beyond the range of adjustment and even instability, may result from attempting to add this circuit. Some commercial equipment circuits are not suitable for incorporating the Bishop limiter. This is usually in transceivers, which lack noise limiting circuits while needing them most for mobile operation.

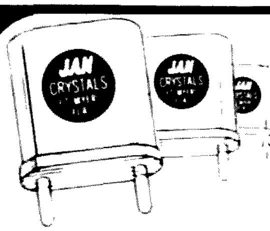
Fortunately, the Bishop limiter will work almost as well at audio frequencies as it does in the i-f region. By using the correct component values and connecting the limiter across the audio output of the product detector or a subsequent af stage, very satisfactory reduction of impulse noise peaks can be accomplished (see Fig. 2). If the limiter can be connected *before* an audio-derived agc circuit, it is especially effective in reducing the take over of receiver gain caused by noise pulses developing agc.

The audio Bishop functions just like its i-f cousin. Audio signals rectified by the two diodes develop a bias across R1 and C1, such that the diodes are back-biased and can only conduct when signal peaks exceed the bias level. Short duration pulses exceeding the desired signal level are therefore clipped. The limiter is a full wave type and is self-adjusting to the signal level.



RL	R1	C1	C2,C3	CF
10K	50K	.022	.22	.005
50K	270K	.005	.05	.001
1 MΩ	5 MΩ	.001	.01	50 pF

Fig. 2. Schematic of the audio Bishop noise limiter.



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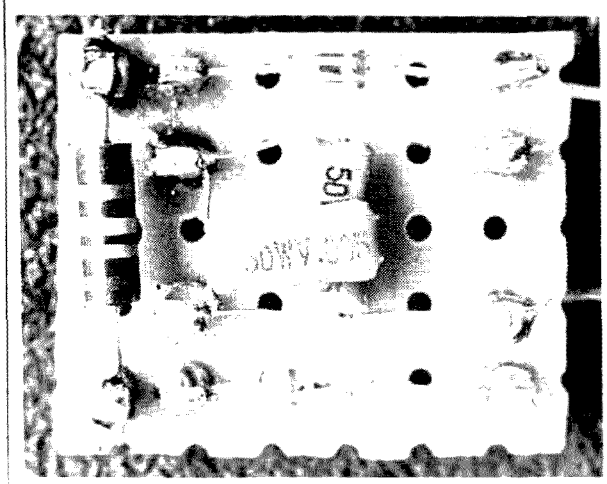
The component values are dependent upon the impedance of the audio circuit, and those shown in Fig. 2 are suitable for the 50K load (af gain potentiometer) in my Galaxy transceiver. The table shows alternate values for other common load resistors.

Some adjustment of R1/C1 values may be required for individual applications. Increasing R1 will reduce clipping, and vice versa. C1 sets the time constant of the bias on the diodes, which must be long enough to maintain bias between speech peaks. Too large a value of C1 will permit noise to increase the bias and degrade the limiting action.

The diodes are fast-switching silicon types, and the 1N916 types are typical. Any residual clipping distortion can be minimized by connecting the capacitor cf, with a suitable value to cause a 3 dB roll-off at about 2.5 kHz.



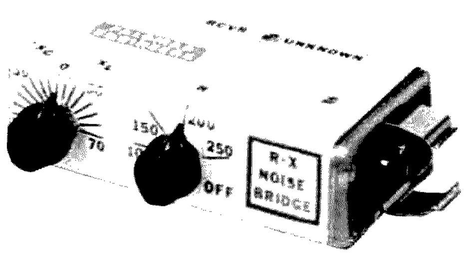
The audio Bishop component board layout.

As shown in the photo, this handy little circuit can be built on a 2.5 x 3 cm piece of perforated board. The two leads are just soldered to a convenient audio connection and ground. If you want to be able to switch off the limiter, a suitable switch may be connected between the ground lead and chassis-ground, as shown in the schematic. The circuit board may be encapsulated in epoxy, or simply wrapped with plastic insulating tape, and tucked into some convenient corner of the rig.

Come trade-in time, the limiter can be removed by disconnecting the two leads, leaving no evidence of modification.

. . .W6AJZ

R-X NOISE BRIDGE



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4U1ITU - GENÉVE

The Jet d Eau de la Rade, thrusting 400,000 gallons of water 427 feet into the air every hour appears to be much less than the World s tallest fountain from my comfortable window seat 5,000 feet above the lake. Spying Geneva through my port window on Air France flight No 026 from somewhere in the Mediterranean is just as exciting now as the first time I viewed it one year ago. The model-like city as well as the horizon disappear from view as we bank right beginning our final descent to Geneva International Airport.

Geneva isn't at all like an American city, or any other international city for that matter – unexpectedly small, peacefully quiet, immaculately clean, outwardly friendly and surrounded by breathtakingly beautiful countryside. Why? This is Switzerland, land of cuckoo clocks, chocolate, cheese and amateur radio station 4U1ITU.

Definition: "DXpedition" is operating under a special license agreement as the only amateur station in a call area recognized individually on the DXCC list. Now there are two ways to go on a DXpedition; (1) you can pack up all your gear, rent a tent, borrow a sleeping bag, generator and tin cookware set, buy controlling interest in an aluminum tubing company, make reservations with Air India along with the People's Government of the Malagasy Replublic (and by all means don't forget an extra pair of finals) or, (2) you can simply visit 4U1ITU. Assuming that we're all inherently lazy and using the excuse that we're down to our last pair of finals anyway, we'll choose the second alternative to a "DX'ers Paradise."

Once you've gotten unpacked and have secured all-day Lake Geneva steamer excursion tickets for the XYL and number one son, you're ready to head up to the "shack." Take a taxi, or better yet, stroll along the lake's east shore following the signs to Place de Nations. At the top of the hill look to the left for a large white building. The one with the "aluminum forest" on top – that's the International Telecommunications Union building. Go inside and take the elevator to the fifth floor, bear left and keep an eye out for the door with the QSL card on it. Within its walls – DX LAND – United Nations amateur radio station 4U1ITU.

After lunch I was greeted by Mr. Brossa who informed me that he was not a ham but was well acquainted with the International Amateur Radio Club and its station. He is employed by the International Telecommunications Union, which is a branch of the United Nations. One hundred and forty countries organized the I.T.U. to help regulate, plan and standardize international telecommunications. Mr. Brossa's assignment is compiling quarterly time/frequency charts of the world's international broadcast stations. A complicated and tiresome job, even with the aid of the modern Univac computer. From his pocket he pulled a key and opened the door to "RF Heaven," the HF shack of 4U1ITU. After a friendly briefing on the station's operation and equipment, Mr. Brossa wished me luck, asked that I phone his office before leaving, and then left me to my own fancy.

What a shack! From my padded swivel chair it's a sight to behold. Three walls are plastered solid with certificates and awards from every DX contest ever held. And

between the certificates, at least a thousand or two exotic QSL cards. The wall to my left from ceiling to floor is glass. The view – fantastic. In the foreground the city of Geneva. Rising majestically from the still waters of Lac Leman, the fountain, now very much fitting its title as the world's tallest. Across the lake on the sloping green countryside are the estates in the village of Cologny. All set against a backdrop of Face du Mont Blanc, capped with early summer snow. The desk directly in front of me contains a Collins KWM-2 transceiver, 30L-1 linear and Collins station control. To my right, another table with a Hallicrafters SR-2000, external LMO and station control. The station welcomes visitors during regular business hours Monday through Saturday, and of course, any time during contests. All of the equipment was a gift from the U.S. government to the U N. – I.T.U. in Geneva. And the antennas – you name it, they've got it up on the roof!

Let's see, I'll tune up the "S-line" on 20 SSB, point the TH6-DX at about 300 degrees and see if the band's open. "QRZ Twenty, this is Four Uniform One Italy Tango Uniform, United Nations – Geneva." ZAP!! A GW3, DK5 and an SM6 all called me at the same time. "Let s take the GW3 station first, this is 4U1ITU, bye."

"Thanks for the fine QSO Norm. You're my first 4U1, *please* QSL. 73 and good luck to you there in Geneva. 4U1ITU this is GW3UK, clear." The frequency erupted – the KWM-2's "S" meter flew off scale, so did I! I was under an unbelievable pile-up. "The JW8 station on Bear Island, please call again. This is WA3 – er, sorry – 4U1ITU, bye."

There was more DX on that frequency than K3HTZ and the combined membership of the Frankfurt Radio Club could shake a driven element at! Hour after hour, QSL card after QSL card, log page after log page, without ever touching the VFO, the pile-up grew steadily. "OK gentlemen, we're going to take a break now. I'll be back in five minutes. This is 4U1ITU Geneva temporarily clear." "Click" – silence on the frequency, but a thousand ears waiting for my return. While gazing out the window I heard a G3 tune up and then call CQ. He was immediately jumped on by two stations simultaneously, who told him to QSY or wait his turn for the 4U1.

"We're back, gentlemen. Thank you for waiting. This is 4U1ITU United Nations – Geneva, bye on the frequency." After working another page of stations I decided that if I was to keep my 7:00 P.M. dinner engagement, I had better say 73 and pull the big switch. "Yes, I'm filling your QSL card out now. Thank you for the call, and I'll look for you from the home station. XK2AE this is 4U1ITU standing by for one more contact before shutting down. This is 4U1ITU – Geneva, go ahead."

The whole band broke loose this time. It was all I could do to single out a call, but pick one I did. I completed the QSO, bade everyone 73 and thanked them for their patience. "This is United Nations radio station 4U1ITU with WA3KEY at the mike, at the International Telecommunications Union Building in Geneva, clear." As I turned off the KWM-2 and the receive audio faded away I could still hear stations calling – "One more QSO. This is 9Q5 . . . " "Just a signal report, please . . . " "QRZ 4U1 . . . "

I entered a note of thanks in the station's visitors log and phoned Mr. Brossa, who said he'd meet me at the door and call a taxi for my return to the hotel. (Or in your case, a taxi to Pont du Mont Blanc to pick up the XYL who has already been waiting two hours!)

"How do you like it here?" Mr. Brossa asked. "Can you come back tomorrow? We'd like to see the station on more often. We have an extensive library on communications on the ground floor if you'd like to stop back in the morning." What could I say? What would you say? "I'm sorry, Mr. Brossa, I'm leaving for London in the morning. I had a wonderful time operating the station. I sure wish I could stay longer. Thank you very much."

"Next time," he replied. "Yes, next time," I smiled. "I'll be back next time."

How about it – next time you take a vacation, tell your wife she doesn't really need a new washer and dryer. Or take a second mortage on your new 2-FM rig. Go DXing 4U1 style.

. . .WA3KEY

MEASURE YOUR VOLTAGE RATING

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15933 South Grove
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Have you ever wanted to set a needle gap or a ball gap for a desired arc potential but didn't have sufficiently high voltage for checking purposes? Or have you ever wanted to know the voltage rating of a surplus air variable capacitor? This procedure makes use of a common dc power supply, a means of measuring capacitance below about 1500 pF, and a bit of basic theory.

The procedure is as follows:

1. Set the capacitor to full mesh and measure its capacitance with a capaci tance bridge, or determine its value by use of a standard inductance and a grid dip meter. Call this value C_{max}
2. Charge the capacitor with a dc power supply having about 500V output.
3. Remove the power supply lead from the capacitor stator terminal and *immediately* begin to rotate the capacitor shaft toward minimum capacitance. When the arc occurs due to voltage build-up in the capacitor, stop rotating the shaft.
4. Measure the capacitance at the shaft rotation which produced the arc. Call this capacitance C_{arc}.
5. Calculate the arc potential where $E_{arc} = E \times C_{max}/C_{arc}$.

For example, a 15–400 pF capacitor is charged with a 500V supply and then rotated to the arc setting which measured 100 pF. The arc potential is calculated as $E_{arc} = 500 \times 400/100 = 2000V$. Two or three additional tries with different shaft rotation directions and/or different supply voltages may be used to obtain a group of measurements from which to arrive at a reliable average value. If C_{min} is too close to the minimum capacitance of the capaacitor, use a higher power supply voltage. If C_{min} is too close to the maximum capacitance setting, use a lower power supply voltage. Experience shows that a 20% variation in results is common.

Theory of Operation

Recall from the study of capacitance and charge that the charge in coulombs is equal to the product of capacitance in farads times voltage in volts.

$$Q = CE$$

The initial charge received by application of the supply voltage does not have sufficient time to leak off as the shaft is rotated toward minimum capacitance. The reduction of capacitance then must be accompanied by a proportionate increase in voltage to maintain the product CE equal to Q. Thus it can be seen that

$$Q = C_{max} E = C_{arc} E_{arc}$$

Rearranging the above products to solve for the unknown E_{arc} yields

$$E_{arc} = F \times C_{max}/C_{arc}$$

Notice that the capacitance values form a ratio so that pF may be used as the units of measure. Also it can be seen that the ratio of voltages equals the ratios of capacitance. A 4/1 ratio of capacitance in the above example yielded an equal ratio of voltages 4/1.

This procedure is used on needle gaps and ball gaps by connecting the gaps across the capacitor during the measurement procedure and adjusting the gamps until the correct capacitance ratios, and thus voltage ratios and E_{arc}, are obtained. Obviously, the capacitor used must have a higher voltage rating than that of the gaps.

If ambient noise prevents hearing the small arc, especially for low value capacitors, a darkened room may be required for the sparking to be observed. Use caution with both the power supply and capacitor. A series resistor, or resistors, at the power supply output, can provide a current limitation and thus an electrocution preventative. Any value of resistance from about one megohm up to ten or twenty megohms is acceptable.

Happy zapping!

. . .W9SIA

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Memphis TN 38111

USE THAT 120 VOLT VARIAC ON A 220 VOLT CIRCUIT

There are many times when a variable source of 240V would be very desirable. Unless a Variac or variable voltage transformer is used, the varying of the ac voltage is quite difficult.

Many types of these variable voltage devices are on the surplus market; however, most of these are for use on a 120V line usually furnishing voltage up to 135V.

Should one want to vary the 240V source, the need arises to obtain a Variac for 240V. However, should you have one and it is for 120V only – don't give up. It can be used for this voltage. By connecting the Variac as shown in the diagram, you will notice that both lines of 240V and the neutral, are brought to the Variac. By means of a double-pole, double-throw switch, one may in one position obtain 0–135V and in the other position, 0–255V. This connection will give full coverage from 0 to 255V.

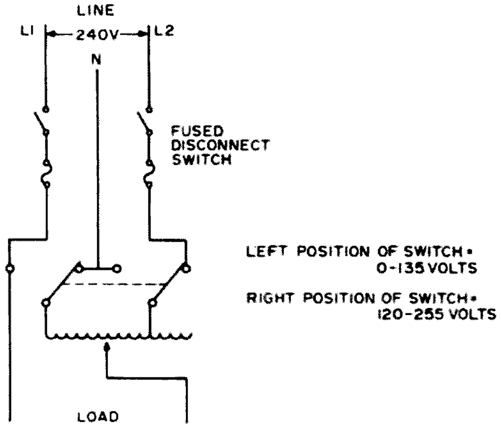


Fig. 1. Variac connections for 0–255V coverage.

I have told many amateurs about this connection and they were very pleased that they could use their 120V component on the 240V source. There are many uses for this circuit – varying the input voltage to transformers, for charging batteries, primaries of silver plating transformers, and others too numerous to name.

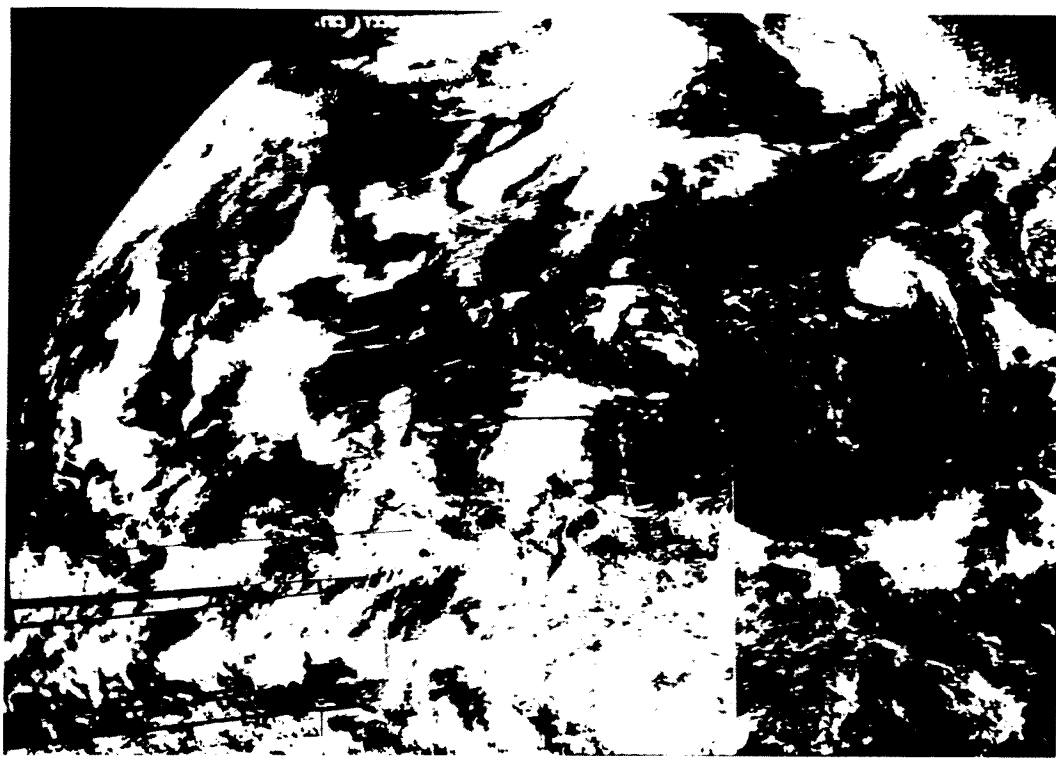
I have used this idea on the primary side of my 240V plate transformer, and it is very useful in tuning up the high power amplifier by voltage reduction on the plate.

So, boys, drag out the old 120V Variac, blow the dust off, and put it to use.

. . .W4GD

Ralph E. Taggart WB8DQT
4515 Oakwood Drive
Okemos MI 48864

Western Satellite Picture On Your SSTV MONITORS



Most radio amateurs are probably armchair astronauts at heart. With this interest in the space program, the idea of receiving weather satellite pictures has probably occurred to many. The problems of setting up a receiving station and acquiring and operating suitable facsimile apparatus has probably discouraged many of those who have considered the problem. This article will describe a simple video converter system that will permit satellite pictures in the APT (Automatic Picture Transmission) mode to be displayed on standard SSTV monitors with only slight monitor modifications which will have no effect on the monitors function in the SSTV mode. In addition, the use of readily available 2m FM gear in the satellite receiving system will be described.

The APT Picture Mode

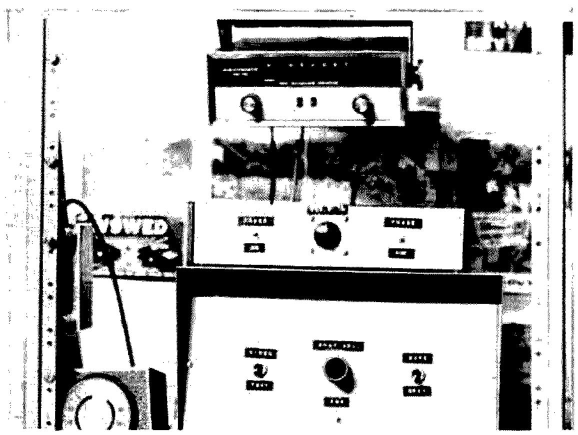
APT pictures are transmitted at the rate of four lines per second for a total of 200 seconds, producing a high resolution 800 line picture. The video and sync information are transmitted by varying the amplitude of a 2400Hz audio tone. The video shift from black to white is accomplished by varying the subcarrier from near zero to 80% of full amplitude. A sync pulse lasting 12.5ms is transmitted at the beginning of each line as a burst of 100% subcarrier amplitude. The

pictures are transmitted in the FM mode in the 135 to 138MHz band. The deviation of these signals is approximately 10kHz.

There are presently three satellites transmitting in the APT mode. ESSA 8 (137.62MHz) is in a near polar orbit at an altitude of approximately 900 miles. This satellite makes approximately three useful daylight passes per day within range of a normally equipped ground station. Unfortunately, ESSA 8 is nearing the end of its operational usefulness in that picture quality is declining rapidly. There are no other satellites of this type planned for use with APT. Two other satellites, ATS 1 and ATS 3, are presently relaying excellent APT pictures on a worldwide basis and systems of this sort will probably be operating in the foreseeable future. These two satellites are located in syncronous orbits over the equator and thus maintain the same relative position in the sky at all times. This is very convenient in that an antenna can be permanently aligned on the satellite of interest. Since there is no relative motion between the satellite and the ground station there is no doppler shift. Fixed tuned receivers of relatively narrow bandwidth can thus be employed effectively. The ATS satellites retransmit computer gridded photos from the NOAA 2 satellite providing cloud cover photographs with map outlines for most of the earth's surface. ATS 3 also provides spin scan photographs of excellent quality, examples of which are provided in this article. The spin scan system on ATS 1 is unfortunately no longer functioning. The six spin scan photos available from ATS 3 each day provide an overlapping photographic mosaic which covers virtually all of the northern half of the western hemisphere. These pictures are very clear and excellent terrain details can be observed if the weather is clear over the area of interest. The primary emphasis in this article will be on the reception of ATS photographs.

The Receiving System

The wide availability of 2m FM gear makes the construction of the receiving system an easy task. Most of this sort of gear can be set up on the satellite band by merely substituting the proper crystals and repeaking the front end circuits. The ATS satellites have low powered transmitters and this in combination with their extreme altitude (22,000 miles) require good receiver noise figure and sensitivity. A good MOSFET preamplifier would probably be adequate even if a relatively poor receiver is used as the heart of the receiving system. My own installation, illustrated in Fig. 1, uses a Heathkit GR-110 scanning receiver with a number of satellite crystals, including the 135.6MHz frequency used by ATS 1 and 3. A Vanguard model 201 preamp tuned to 136.5MHz provides the required system sensitivity and noise figure.



Heath GR-110 scanning receiver with video adapter.

My own solution to the antenna problem consists of the simple expedient of using a HyGain 8-element yagi for 2m. This antenna provides excellent results despite the off-resonance operation. My own experiments indicate that the ATS signals are horizontally polarized and the antenna should be oriented with this in mind. I would be happy to provide data on aiming the antenna to anyone who is actually constructing a receiving station. The process is fairly simple but would take up more space then is justified in an article of this type.

ATS picture transmissions are on a daily scheduled basis. I use a 24-hour timer to turn on the recorder and receiving system at the proper time each day. The nature of the video converter is such that recordings of the satellite pictures are indistinguishable from "live" transmissions and the use of tape is very convenient. Recorders with automatic

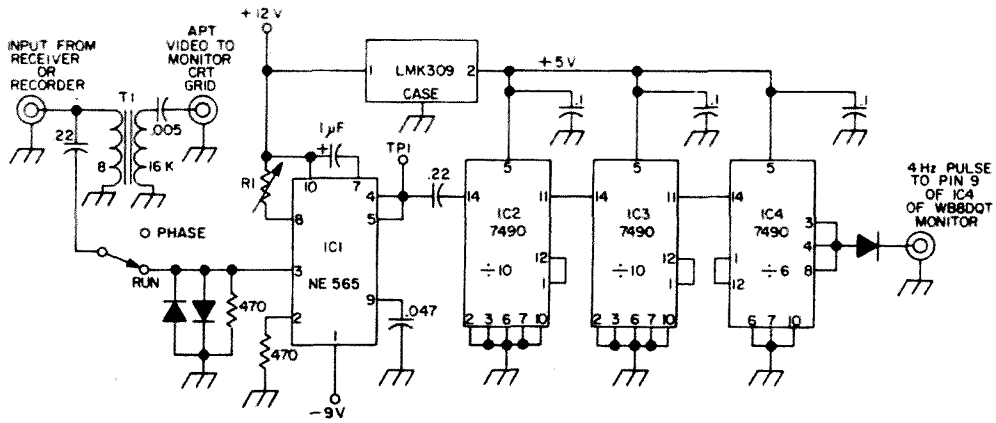


Fig. 1. Schematic of video converter.

level control or other forms of agc may not be desirable in that they may "swamp out" some of the amplitude variations in the audio signal, but these types of recorders should not be ruled out without a trial. My own recorder is an old two track monaural machine which provides excellent results at 3 3/4ips. Results are equally good at 1 7/8ips but the faster speed makes for a more accurate cueing job. Recorder and receiver audio gain should be kept constant from day to day to eliminate the need to constantly make gain adjustments during picture read-out. I find the most convenient procedure is to set the receiver and recorder gain for maximum allowable VU meter reading of the recorder using the noise output from the receiver prior to a picture transmission. This noise output is a convenient reference level that will not change and has the advantage that its always available. The constantly varying subcarrier level in the actual picture transmission cannot be used for this purpose unless an oscilloscope is available to assess peak signal values. Obviously the use of the near "white noise" output of the receiver is an easier solution.

The Video Converter

The functioning of the video converter will be outlined on the basis that it will be interfaced with the WB8DQT SSTV monitor (73 Magazine, August 1973). The basic functioning of the converter is unaffected by the monitor used, but the precise component values used in the modification of the monitor will vary with other monitors and some experimentation will probably be required.

Proper display of the satellite video on the monitor crt is easily accomplished. APT output from the recorder is routed to the video converter input where the varying 2400Hz subcarrier is stepped up in voltage by T1 and applied to the grid of the monitor via a .005μF capacitor. The brightness of the crt trace will increase with an increase in subcarrier amplitude. Despite this rather simple scheme for video display, an excellent gray scale is achieved and there are no dc restoration problems. The volume control of the tape recorder is used as the system contrast control.

The sync system is slightly more complex and involves most of the circuitry of the

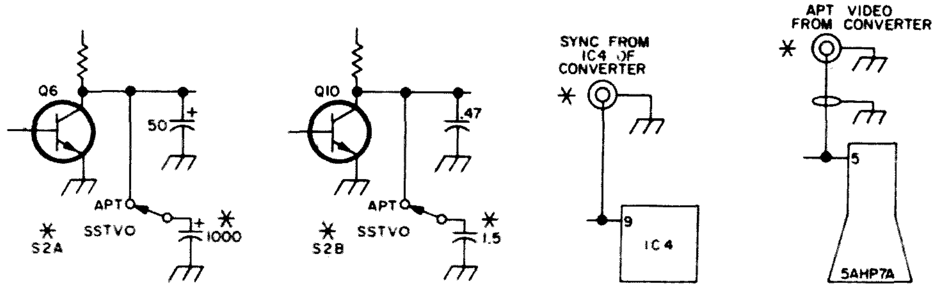


Fig. 2. Required additions to the monitor circuit to incorporate the APT mode.

unit. The 4Hz line rate in the satellite is derived by counting down from the 2400Hz subcarrier (2400/600 = 4). We will derive the proper timing for the crt video display in precisely the same way. Although it is possible to count down directly from the satellite subcarrier, a slightly more reliable procedure was chosen. A sample of the 2400Hz satellite subcarrier is fed to the input of an NE565 phase lock loop (PLL). Only a very small audio voltage is required for the operation of the device and diodes at the input limit the applied signal to a safe value. The PLL contains an internal voltage controlled oscillator (vco) which, with proper selection of the external components, will lock onto the audio frequency present at the input. The PLL vco tracks any variations in the frequency of the subcarrier signal at the input and thus compensates for any frequency variations introduced by the recording process. The vco output is essentially noise free even if high noise levels are present at the input of the PLL. The output of the vco serves as the frequency standard for the sync system and is divided by 600 by three 7490 decade counters to produce a 4Hz square wave with the proper sync relationship to the satellite subcarrier signal. The 4Hz signal is fed to the horizontal monostable in the monitor where it triggers the horizontal deflection system 4 times per second. In order to achieve proper sweep size and linearity, an additional 1.5μF capacitor must be paralleled across the existing 0.47μF horizontal discharge capacitor in the monitor circuit. The required 200 second vertical sweep is initiated manually using the vertical reset switch on the monitor. An additional 1000μF capacitor across the normal 50μF vertical discharge capacitor provides the proper vertical sweep parameters. Fig. 1, shows the schematic of the video converter itself and Fig. 2, indicates the required additions to the monitor circuit to incorporate the APT mode. The additional capacitors in the discharge circuit can be switched in with a DPDT toggle switch, providing a convenient way to switch between the SSTV and APT displays. The video and sync connections have no effect on the monitor in the SSTV mode when the video converter is not in use.

The only problem that now remains is that although the line display on the monitor is properly synced to the line scanning in the satellite, the display may not be properly phased. Improper phasing means that the start of the monitor scanning does not coincide with the start of scanning in the satellite and is indicated by the presence of a vertical white bar, actually the satellite sync pulse, somewhere in the picture. The free-running frequency of the PLL vco is set to 2350 Hz. When S1 is thrown to the phasing position the vco is unlocked from the satellite subcarrier and runs free, putting the horizontal display out of sync. When this occurs the white sync bar will shift over to the margin of the picture since the satellite line rate and monitor line rate no longer coincide. When the bar reaches the picture margin S1 is returned to the run position, the vco locks to the subcarrier, and a synced condition is re-established. This process is summarized in a diagram in Fig. 3.

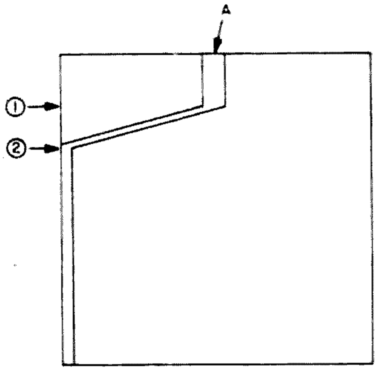


Fig. 3.

Converter Construction

The circuitry is essentially non-critical and any mechanical assembly which permits proper interconnection of the circuit elements may be used. My own unit is constructed in a Ten-Tec enclosure shown in the photo. The unit need not be large and could actually be built into the monitor if desired. The power, phasing, and vco frequency control (R1) are located on the front panel. The power connector, input and sync and video output are on the rear apron. The sync and video connectors added to the monitor can be placed on the rear apron. The DPDT

toggle switch for changing between the SSTV and APT display is most conveniently located on the front panel of the monitor although this is certainly not required.

Alignment and Use

Place SI in the "phase" position and adjust the vco frequency control for 2350Hz at TP1. This frequency is not too critical and initially setting up for a frequency just slightly higher than the 2300Hz SSTV white frequency will do for a start. If the free running vco frequency is too close to 2400Hz phasing will take longer to accomplish while if the frequency is too far from 2400Hz phasing will be too rapid to be accomplished accurately. In practice, the final setting of R1 is adjusted to provide a comfortable phasing rate.

The monitor display should be viewed in a darkened room to visually evaluate the nature of the pictures. A darkened room is absolutely essential for photography since a 200 second time exposure is required. With no APT input adjust the monitor brightness for a barely visable trace. Advance the APT recorder output for a good black to white video swing on the monitor display. If the vertical sync bar is present, place S1 in "phase" until the bar moves to the margin of the picture and then return the switch to "run."

Operational Notes

ATS 3 transmits on a frequency of 135.6MHz from 0730-0815Z and 2045-2130Z. The first transmission of the day consists of APT orbital prediction data and NOAA 2 gridded pictures. The second transmission sequence consists of 6 spin scan photos and updated NOAA 2 photos. There is a white calibration signal transmitted between each picture and phasing is easily set up at the beginning of a picture sequence. As long as the recorder is not turned off, proper phasing will be maintained throughout an entire sequence of pictures. The start of each picture is clearly audible and the vertical reset switch can be pressed to initiate the vertical scan.

Photographing the display consists of making a 200 second time exposure as the display reads out. I have used Plus X and Panatomic 35mm film. Polaroid also works well. The 73 SSTV Handbook contains information on making photographs from a monitor display and the same techniques may be used for the APT pictures.

There are a total of six spin scan photos transmitted each day by ATS 3. These photographs are part of a single photographic mosaic. The photos fit together, in order of their transmission, as shown in Fig. 4.

1	2	3
4	5	6

Fig. 4. Mosaic plan of 6 spin scan photos.

The best pictures are obtained when the satellite signals are full quieting in the receiver, although acceptable pictures are possible even with relatively high noise levels. For best results, you should optimize the system for full quieting operation. This is not difficult and is well worth the trouble. The satellite signals are remarkably consistant from day to day, although observations by myself and WØOQC indicate that some drop in signal level often occurs when strong tropo openings are present. If you have difficulty in maintaining a consistantly high signal level you might try mast mounting a preamp.

There is an endless fascination in watching the earth from space and I hope some of you will give it a try. This is an ideal activity for those already involved in Slow Scan and provides another excuse for those of you who haven't tried it yet. Come on in and double your fun!

...WB8DQT

How does the possibility of going to hamfests, or any gathering of hams and making over $100 sound to you? For more information on becoming a local representative for 73 Magazine, write

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John Johnston K3BNS

Someone Should Do Something About...!

There have been many requests for help from club presidents, club members, and people who are trying to form clubs. This article, originally printed in April, 1966, gives a dramatic picture of the typical ham club. The author, now assistant in charge of Amateur and CB affairs of the FCC, also advises that the club president is not elected as an honor – he is elected because it is believed that he can perform the work necessary to prevent the club from looking like that in his article. One of the biggest mistakes the president can make is to push his pet ideas; he should be able to guide the club in the course of action that they want to take. The president is a leader and should set an example for each future president of the organization.

One of the more interesting facets of amateur radio is the opportunity to participate in unique organizations loosely identified as 'radio ham clubs." Upon considering that each member has progressed through a filtering process designed to eliminate all but the most dedicated, it is interesting to observe the results. First he has had to culture an interest in a very demanding hobby, subject himself to an agonizing period of learning rules, theory, customs and Morse code. Next under protest, he has indulged in outrageous expenditures for equipment. Then he has been further motivated to seek out the companionship of similar individuals. Finally, he not only endures, but delights in, attendance at regular club meetings.

These meetings follow proceedings that have been universally adopted. One familiar with these rituals can freely move from one geographical location to another and find solace. Unfortunately, these rites are not documented and the uninitiated must learn them the hard way. The constitution of any given club is usually of little benefit, for example, and reference to it can only result in confusion.

The most important things to bear in mind are that the members attend these meetings for entertainment (viz: night out from the XYL), and the club president is charged with providing some type of diversion, such as a speaker. In fact, some observers are of the opinion that this is his only purpose, and his re-election is dependent upon his degree of success in this vain.

All radio club meetings are called to order 45 minutes after the announced time. This allows a period for members to indulge in a quaint pastime known in amateur radio as the "eyeball QSO." This informal preliminary event is comprised of impromptu discussion centered on three (3) general areas of exaggerated claims:

1. Lamentation of the heavy demands placed upon one's station by rare DX operators desiring a QSO.
2. The amount of high power one is utilizing, including various precautions to insure that a minimum of 1 KW output is always maintained.
3. The vast superiority of one's equipment; the extent of the claims being in proportion to his desire to unload it.

Of particular note are the audience participation entertainment meetings where a special game is played. The neophyte would be advised to suppress his urge to fully participate in this game until the rules are fully understood. It begins with the president announcing. "Tonight will be a business meeting!" meaning he couldn't obtain a speaker.

Upon this signal, the members are alerted to critically observe the proceedings, concentrating upon finding the "debate item." As the chairman routinely calls upon each committee head for a report, some of the more dedicated members warm-up for the main debate event with comments and questions somewhat relevant to the report. Candidates for team captain can thus identify themselves.

The main debate item is usually selected between 15 and 20 minutes after the call to order, when boredom has set in. While the scope of these items are vast, there are certain criteria which must be met in order to enjoy full participation.

1. Under no circumstances must the debate item result in any additional work for anyone except the president.
2. It must not encompass anything of real consequence. Abstract and theoretical subjects are ideal.
3. It must not be so complex as to allow for more than two points of view.

After several false starts, the debate begins to unfold. The teams can be identified as play continues. The chairman must make an important decision which has a significant impact upon the organization of the two teams. If he elects to assume the neutral role of an umpire, the teams are divided by an imaginary front-to-back line down the center of the audience. On the other hand, when the chairman declares himself a player, the division is automatically front vs. rear. Because the chairman holds a strategic position in the room (and often is a little more informed on the background of the subject), his unfair advantage is offset by limiting his team to those on the rostrum and – depending upon the size of the audience – from one to three of the front rows.

The tap-off is initiated by a potential team captain who arises and demands "that something be done!" concerning a certain item. It is imperative that he not be specific about what should be done or by whom, thus preventing a premature completion of the game. Heroically seizing the initiative, a candidate team captain for the other side recognizes the challenge and rises in reply. It is not pertinent that his retort reveal any great enlightenment – delivery is the critical aspect of winning these coveted positions. When the debate item is acceptable to the audience, they so signify by responding to the call-to-arms, and the main event can proceed.

Observing protocol, members from each team rally to their selected captain and alternately rise to repeat his argument, interspersing their commentary with items usually unrelated to the subject. The individual member can find great comfort in addressing the captive audience and is willing to endure listening to the others in return for his opportunity to get a few things off his chest. (Most covered topics: CB, deplorable state of amateur radio, TVI). Besides, 50% of the audience is on his side before he even starts.

Veteran observers are quick to point out the upswing of interest in the game since the wide acceptance of VOX keyed transmitters. Before this dastardly technical

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advancement, an operator could pour out his feelings into a microphone for all the world to hear (in reality, it would only be one other ham who was partially copying R3 X S4 with heavy QRM), and he could rave on until he got good and ready to manually throw the transfer switch. He now feels frustrated by automation since every time he pauses to take a breath during his discourse, he is vulnerable to being cut-off. An individual with this particular problem can be rapidly identified in everyday life by his continual interjection of the phrase, "AWWWWW," after every sentence.

In the unfortunate situation where the audience seating arrangement is such as to make the imaginary division line indistinct, an individual not quite sure of which side he has been assigned may be prompted to arise and summarize the two positions, and either offer a compromise or request a motion. This is an obvious delay of the game and he is penalized by a loud admonishment by both sides as he slinks to his seat. Outcast, he remains silent and makes note not to sit in the middle next time.

The game is completed when an arbitrary time limit is reached, usually 10:45 PM. The finale is quite rapid with the chairman dissolving the two teams by requesting volunteers to work on the problem. This is the signal that the game is over and everyone is to remain silent.

Any important items are disposed of rapidly without comment within the next 5 minutes so the meeting can be adjourned to a nearby tavern for a victory celebration by both sides. The team captains shake hands and agree, "It was good to clear the air!" Midnight having been established by XYL s, Inc. as the "time-to-be-home-from-the radio club by," the "eyeball QSO is resumed with the sky-the-limit for exaggerated claims, until the magic hour.

As the members happily return to their homes with fond memories of a battle well fought, mentally rephrasing what they said or wish they had said during their speech, the true value of the radio club can best be appreciated. . . .K3BNS

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NOSTALGIA

I will never forget the day in 1922 when Bud came running breathlessly over to my house, "Come quick, Howie just built a radio." We lined up to hear KUO, the San Francisco Examiner on "genuine Brandese earphones." We gaped at the wonder of such technology. The radio consisted of wire wrapped around a Quaker Oats box (round and about 6" in diameter). On one end of the box were two binding posts and the cat whisker – that part that gave magic to the whole system. To tune the radio there was a slide contact that shorted the turns to one end. There was no capacitor as the intrinsic capacitance of a coil that large was enough to provide all that was necessary.

Every one of us rushed home to beg our folks for the wherewithall to build a radio. Magazines and newspapers had construction plans and Woolworth's 5 and 10 had a 50 foot counter loaded with gadgets and gimmicks necessary to create electronic wonders.

These were the days of solid state radio. We chose galena holders and cat whiskers with more care than a computer man with Motorola's handbook. We swapped galena of all kinds, many things worked; iron sulphide, lead sulphide, carborundum – we went to an old iron mine and dug through the tailings for choice pieces of pyrites. Every time you got a station coming in real well someone would jump on the floor and the music was gone. Looking back, I think the doping in natural crystals wasn't uniform and there were sensitive and dead places all over the crystal. Solid state manufacturers will say, "If you think that has changed you should see my rejects."

It was a proud day when I got my first "variable condenser" (capacitor to you kids). It had round plates, about 40 of them, and all the stations were jammed down on one end of the dial, but it enabled smooth tuning without jumping the cat whisker off the sensitive spot. Then that damned kid across the street built a one tube regenerative tuner and solid state was set back for forty years.

I graduated to radio tubes and kept myself broke buying dry batteries. The 45 volt B batteries cost the most and seemed to die when you wanted to show your receiver to someone. The A batteries were what we

called doorbell batteries and when they got weak you punched holes around the bottom and put them in a pan of water and vinegar and they came to life again.

The most popular circuit was the regenerative tuner we knew about the superheterodyne but why use eight tubes when you could do the same thing with one tube. I had a modified colpits circuit receiver and one time at 3 AM California time, I heard KDKA in Pittsburgh, PA. We did a lot of DXing on broadcast band in those days; records only ran three minutes and station announced after each record. The big problem was the QRM. Every time a station would start to announce some nut down the block would try to tune in and heterodyne with your receiver with nothing but cat calls.

I took radio code in high school. You had to receive six words per minute to get a ticket. We would go around the school whistling dirty words to each other. This would start at a real high pitch and gradually go down to almost inaudible – in an imitation of what you could hear on the air. There was no such thing as frequency stability. When you copied someone you held your hand close to the tuning knob and moved it back and forth to adjust the pitch with body capacity. Radios were built on Bakelite panels and the wiring was composed of bus bars about 1/16" square and all made parallel with right angle bends – to look nice, and there was more feedback and capacitive pick-up than anyone dreamed. We knew that a finished set hardly ever worked as well as the bread-board model but we hadn't figured out why.

Carl was the first kid in our set to build a transmitter. We talked about it a lot before it came to reality. By now it was 1928 and we wanted to construct a real state-of-the-art set using a vacuum tube, and direct current, and we especially wanted to get on 20 meters where you could hear half way around the world. It was getting real popular, sometimes there would be five or six stations on the band at one time. Carl had scrounged a commercial type vacuum tube from a local radio station; it was gasey but it worked fine. When you pushed the key it would light up the whole room with a beautiful blue light. It was a beautiful effect with the bright red plate (we hadn't discovered neutralization yet). The direct current was a dramatic system composed of a 4 kv utility transformer run backwards into a string of rectifier jars containing borax solution and aluminum and iron plates. When you hit the key everything hummed and bubbled and steam rose up and fogged the window. There was no code monitor you could hear your transmitter, and see it and smell it. In spite of the dc, we got a lot of rac reports (raw alternating current) filtering was not yet a science. The best reports came from far away – Hawaii and Australia always liked the tone. We had lots of power, the problem was in getting it to go out that wire into the antenna. We spent more time building antennas and counter-poises, and feeders than we spent on the air.

From 1928 to 1930 things moved rapidly. Rectifiers became well known and transmitters were all push-pull output. Crystals became popular. One kid in school was a real nut – he said that pictures could be transmitted by radio and just to prove it he had a setup in his basement where he scanned a picture with a disk with spiral holes in it. About twenty feet away there was another disk that scanned the light from a neon bulb – and with the lights out, and your eyes used to the dark, you could see a sort of image. But anyone with any sense knew that nothing like that would ever be practical. That's why I now believe in everything; flying saucers, justice, equality of man, any crackpot idea you can present.

They say that a man may go far but he never entirely leaves his first love – that may be true; I still think that 40 watts of CW on 20 meters is just fine. Most of my gear is store bought now, but out in the garage is a junk box and I was looking for something the other day and I came across a little 1/2" diameter cup with a screw in one side and a hold in the bottom – a galena cup!! A little more searching turned up a 10Ω rheostat, a carbon pile resistor, two thyratron rectifiers, a matched pair of 6L6's, and a Tesla coil that would do wonderful things, including jamming all the communications within five miles. Sic transit gloria mundi.

. . .WB6JNI

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A UNIVERSAL IC TESTER

The appearance of the 8¢ IC has made apparent the need for a unit which would test and identify both marked and unmarked IC's. The units referred to are available from Poly-Paks. They are TTL, 14DIP at the attractive price of 60/$5.00. Several groups of these units have been purchased and of these, more than 80% were identified. The balance were assumed to be defective or not properly identified for test.

A block diagram of the box functions is shown in Fig. 1. I will describe in detail the pulse generator, which may also be used as a separate variable frequency square wave generator with the proper timing capacitor for frequencies up to several hundred kHz. Figure 2 shows the LOAD INDICATOR circuit. I'll leave the power supply to your imagination since too many words have been wasted already in articles on how to construct power supplies. In the event you already have a bench supply, you may wish to eliminate this section anyway.

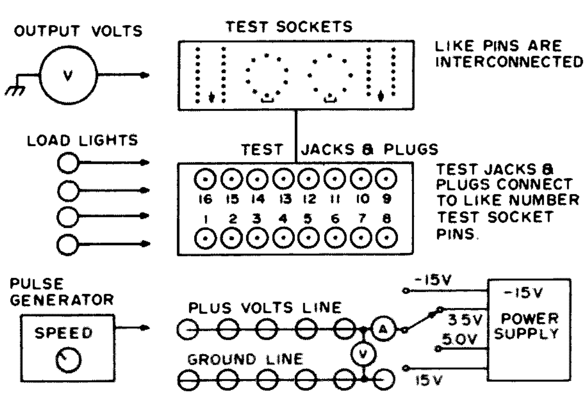


Fig. 1. Block diagram, IC tester.

An IC, let's say, a SN7400, to be tested, is inserted in the proper socket. Being a TTL unit the power supply is set for 5 volts. A plus voltage plug is connected to jack 14 and a ground plug to jack 7. A power supply current of less than 25 mA indicates the device is not drawing excessive power. A load indicator is now connected to one of the output leads (say #3) and the pulse generator connected to one of the inputs. Observing the load indicator and connecting the output meter to the input being tested will show the action of the device under

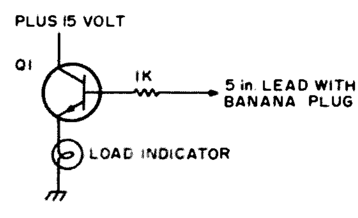
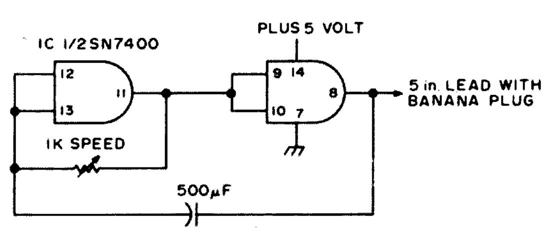


Fig. 2. Circuit 2. Load indicator.



Circuit 1. Pulse generator.

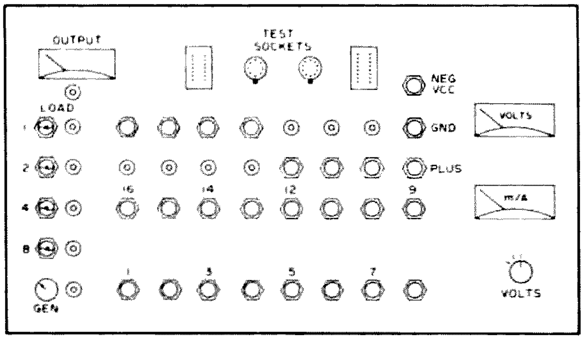


Fig. 3. Construction details.

Construction Details: All common numbered socket pins are interconnected. Socket pins 1 thru 16 are connected to test jacks 1 thru 16.
BANANA JACKS
5 inch leads with banana plugs attached.
All jacks and plugs in the plus row are interconnected.
All jacks and plugs in the GND row are interconnected.
The voltage select switch connects the PLUS row to the indicated power supply voltage.
OUTPUT VOLTS Same as power supply voltmeter
LOAD INDICATORS Circuit #2
SQUARE WAVE GENERATOR
METERS – Surplus VU. Volts – Use multiplier for 15 volt F.S.
M.A. Meter use shunt for 35 M.A. F.S.
VOLTS CONTROL 3.5, 5.0, 15V.

actual conditions. All IC data books give TRUTH TABLES which will show you what to expect.

In addition to the leads in the box, 3" or 4" leads with plugs on each end are handy for cross coupling gates as oscillators, or to jump required pins on some units.

An IC data book is a must for identification of unknown units. A check of the various base diagrams will disclose there to be a somewhat consistent pattern to the lead functions. GATES for instance in the TTL/7400 series usually use pin #14 as Vcc or plus volts, with pin #7 being ground. Insert an unknown in the proper socket, connect Vcc and ground and check the power supply current for a reasonable reading. Now with the output meter lead search for any pins that show a voltage near the Vcc voltage. If you find voltage at pin #3 the usual pattern is that pins #1 &2 are inputs. Connect the pulse generator to these pins and observe the meter or load indicator connected to the output for an indication.

In testing OP AMPS and regulators, which are basically direct coupled high gain amplifiers, follow the same procedure for Vcc and ground. Find an output and apply the generator input at a very low level. You may even wish to hold the generator lead in one hand and touch the input pin with the other hand. Crude, but it will identify pins and show the device to be functional.

I believe at this point, further discussion would be of little value. Take an evening or two, build the box, order a batch of IC's and have some fun.

. . .WB4MYL

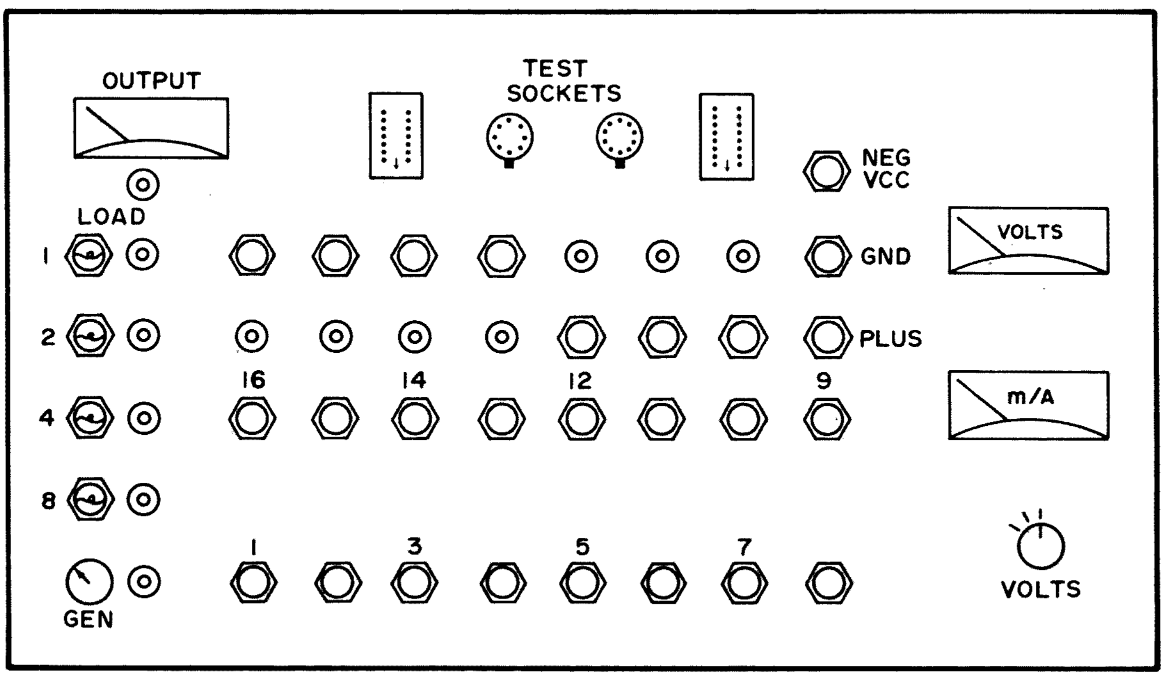


Fig. 4. Full size layout of IC tester.

Carl C. Drumeller W5JJ
Oklahoma City OK 73169

TABUS

We like to consider ourselves an enlightened people. Oh, we may kid a bit about black cats crossing our paths, and things like that . . . but, superstitious? A thousand times NO!

Oh? Then how about the tabu on using liberal heat while soldering or desoldering transistors? "Everybody knows it'll destroy a transistor." Like hell it will! I've taken hundreds of transistors off circuit boards, getting them hotter than the proverbial little red wagon, then popped them into my transistor tester (an oscillator at 7 MHz), and found them still to be in good operating condition.

Another tabu: Never try to bridge a gap between two wires with solder; it can't be done. Again, like hell it can't! It does it all too readily, as anyone who has ever tried to tap on to an Air Dux coil or has worked with close lines on a PC board knows full well!

Another tabu: Don't use soldering paste; it'll result in unreliable joints. Maybe, but I've used it (only with those stubborn metals or finishes that laugh off ordinary solder) for over 45 years and have yet to see a joint that was adversely affected.

Another tabu: Never dare solder without having first joined the two items in a strong mechanical joint. This tabu undoubtedly was started by the Devil himself! One does not have to be a fundamentalist in his religious beliefs to have a firm conviction that there must be some special corner of Hell reserved for those who make mechanical joints before soldering. The hottest portion is for those who use stranded wire. Those condemned souls labor through all eternity vainly attempting to clear lugs from tightly twisted wires! It'll soon be 52 years since I built my first piece of amateur radio gear. In all those years, I can't recall an instance of having seen a joint fail because of not having been made mechanically strong before soldering!

No doubt you can add many other examples of the superstitions and tabus that hem in amateur radio. Our child-like faith in these beliefs is downright touching! Nobody dares to question or to check. It was less than a thousand years ago that every doctor, every scientest in Europe *knew* that a woman menstruated only in the full of the moon. Don't laugh! We still blindly accept many such contentions. And we, just like our ancestors of a thousand years ago, never dream of being so bold as to raise a question.

. . .W5JJ

Reprinted from "Collector and Emitter"

Bill Hoisington K1CLL

Making It Small

The first of a series on pocket size rigs, using ICs throughout, including the front end.

This article concerns subminiature techniques and methods for building home brew Two Meter FM receivers, transmitters, and transceivers. A complete, I.C., double compound (two cascodes in cascade) rf amplifier at 147 MHz is detailèd in this article as an example, which is only 2¼ long, ¾ wide, and 3/8 high, in inches.

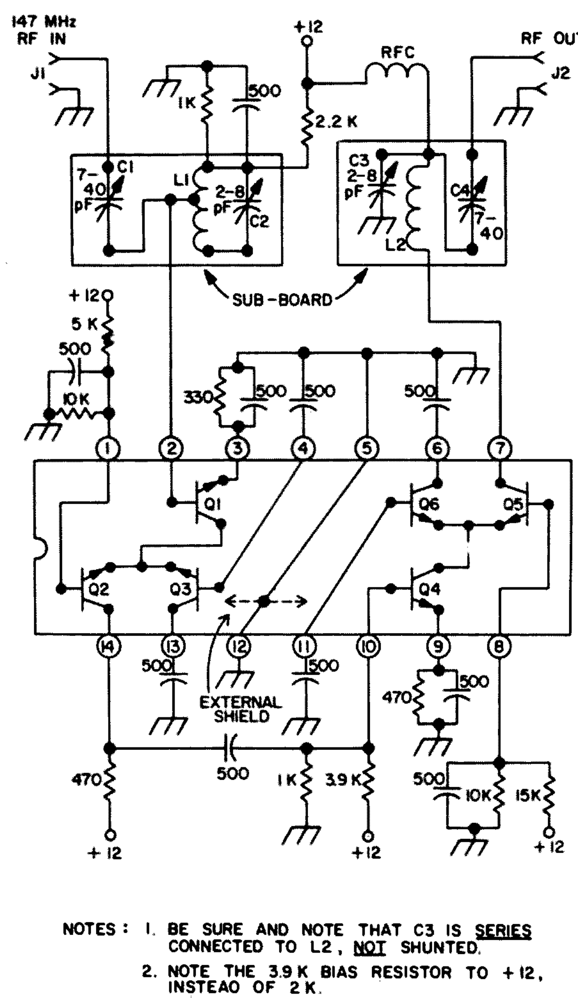
What this will mean to you. This subminiature work is not easy, so look it over carefully before starting. You will need either good eyesight, or magnifying glasses if you are my age. (69). You will also have to order almost all new components, such as 1/8 watt resistors, capacitors 1/8′ by 1/8″ by 1/16th, an I.C. with six 1gHz transistors in it, ceramic trimmers 2/10ths of an inch in diameter, subminiature wire and solder, and a good "tiny-iron." Then you can start, if you can also wind coils 3/32 of an inch in diameter!

It is my intention to present a series of articles on this subject, rf stages, front end, and a single conversion if strip, all subminiature. Examples will be shown on 220 and 450 mHz also.

The I.C.

As usual, through the decades since well before WW2, when screen-grid tubes became available, it has been mainly through the development by the BC industry with their millions of customers, on into transistors with hundreds of millions of "radios" now being made all over the world, that we now come into the second major revolution, the integrated circuit, or I.C. When an 80 transistor HI-FI FM set can be photographically reproduced and put into a tiny plastic package and sold for $2.54 (quantity lots) there is no longer any possibility of competition, so let's join 'em instead of fighting 'em.

The I.C. being used in this article is the RCA CA3102E, certainly a definite rf milestone in I.C.'s, because it has six 1gHz transistors inside it's shiny black carapace. Furthermore, these are arranged in the 14



NOTES : 1. BE SURE AND NOTE THAT C3 IS SERIES CONNECTED TO L2, NOT SHUNTED.
2. NOTE THE 3.9 K BIAS RESISTOR TO +12, INSTEAD OF 2 K.
3. MORE DETAILS ON FOLLOWING FIGURES.

Fig. 1. Schematic, sub-miniature I.C., double compound RF amplifier, 2m FM.

pin package so that either of the two compound amplifiers may be used in the cascode mode, or the dif amp mode. And still further, they have gone to considerable lengths to separate and isolate these two amplifiers, one from the other, so that they can be put in cascade (not cascode), without self-oscillation. The result here, along with subminiature components, is a double-compound rf amplifier with a lot of gain in a space 2¼ long by ¾ wide by 3/8 high, in inches. With modules like this you begin to get the feel for the size of a complete set in a hand-held package.

The complete circuit of this subminiature rf amplifier using the RCA CA3102E is shown in Fig. 1, with layout pictorials following, as half the work involved in placement of the components. Perhaps I should even say *finding* a place for them. The circuit itself is similar to one previously published (in 73, of course) which however was not miniaturized. So the main deal is on how to "Make It Small." Note the use of the two compound amplifiers cascaded, both in the cascode mode. Note also that the near similarity of these words does *not* mean they are the same. The CA3102E may also be used in the dif amp mode but that is another story. The rule is, dif amps for large signals and cascades for gain.

How to see what you're doing. I am 69 years old, in "Radio" for over half a century, and have "standard old age vision." This is the inability to read a newspaper without glasses, but with which (the old age vision) I can see a good looking girl 100 yards away! Does this stop me from making tapped coils 3/32 in diameter? No, because I have two pairs of *magnifying* glasses, one for reading small print, and the other pair, about times two, for micro-transistor work. And believe me, they are vastly superior to those big clusmy 12" O.D. magnifiers that you have to look through and are mounted like a lamp, between you and the tiny board you are going to work on. These eyeglasses are old now, so they have been an excellent investment in my electronic career. With the "times two" pair I can see smaller things and work with them better than the average lad in his twenties. I told you this project is not easy!

Resistors

Several companies have been making good 1/10th and/or 1/8th watt resistors for 20 years that I know of, because I used to use them in pocket rigs with tubes in the early fifties. These little bits of carbon are still good after 20 years, and are almost as easy to work with as the ¼ watters. They are small though, being only .145 long by .062 in diameter. All that I have obtained, and I use mostly Allen-Bradley, are from Cramer Electronics, Inc., 85 Wells Av., Newton, Mass. 02159, Tel. 617-969-7700. They ship C.O.D. also. Get their catalog *first*. You can read the ohmage on these tiny things just like their big brothers, so they will not be wasted, even if you don't get to build the whole set.

Capacitors

The only reasonably priced source I have at present for small bypass capacitors is Radio Lafayette. Their little gems, 1/8th by 1/8th by 1/16th, listed on page 272 of their 1973 catalog, do the job, even up to the 450 MHz, if you use them correctly. Radio Lafayette's latest name is "Lafayette Radio Electronics, 111 Jericho Turnpike, Syosset, L.I., N.Y. 11791. Tel. 516-921-7500 for their "Shop-by-Phone" service.

When using these items you have to proceed carefully with the soldering. They are good, they last decades that I know about, and they measure correctly on a capacitance meter, but you must use a tiny iron and only for about a second. You will *soon* find out just how long you can apply just so much heat! Order extras the first time! I use an American Beauty Iron, Cat. No. 3118 SCP, 30 watts, with a piece of No. 10 or 12 copper wire as the tip, and file it down to about a 45 degree slant. And keep it filed and super-clean and bright-tinned. Tin it immediately after filing (less than one second for best tinning) and shake off extra solder. Do not tin those little baby caps beforehand! And do not use anything bigger than a 30 watter. Certainly not one of those brutal "soldering guns." Pre-form the leads as much as possible before soldering, and don't be afraid of them. I don't lose more than about one in fifty now.

Wire

There isn't much wire in the example circuit in this project, mainly the plus volt leads. Do not use anything larger than sub-miniature #30, stranded. I have some with Teflon insulation, "left-over" from some military project of a dozen years ago, and it is tough to work with. They *have* to use it, and they have *our* dollars to spend on it, which I don't begrudge them at all, but you will find it very difficult to strip. At least I do. Ordinary plastic covered #30 stranded is good enough for this work, because you're not going to apply prolonged heat anyway.

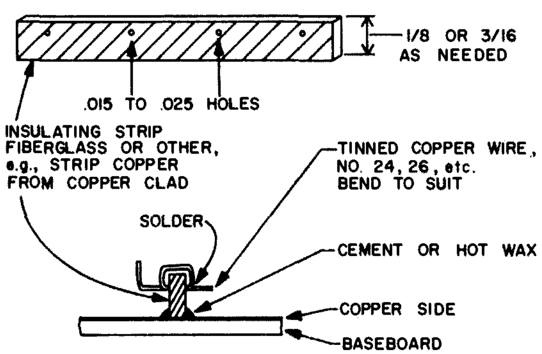


Fig. 2. The points.

Tie Points

Fig. 2 shows a method that you can use for almost any size wire you can see and any size hole you can drill. I have used common pins of .021 diameter hammered into and through .020 holes, but the method of Fig. 2 is adequate for the strips shown in that figure.

Tools

A jeweller's hack saw is useful and is a very good tool to have around in any case. One with a large number of teeth per inch, like 32, or even more is best and with such a saw you can cut the strip shown in Fig. 2 out of the insulating material of a sheet of copper-clad if you do not have thin fiberglass or epoxy sheet on hand. The sheet I used happens to be .030 thick when the copper is stripped off. I used a knife to start the copper off for stripping and then strong pliers and peeled the rest. Do it slowly, and watch your fingers!

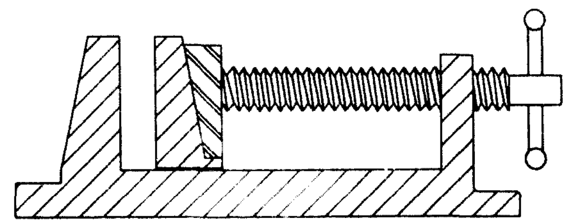


Fig. 2b. Outline, drill vise.

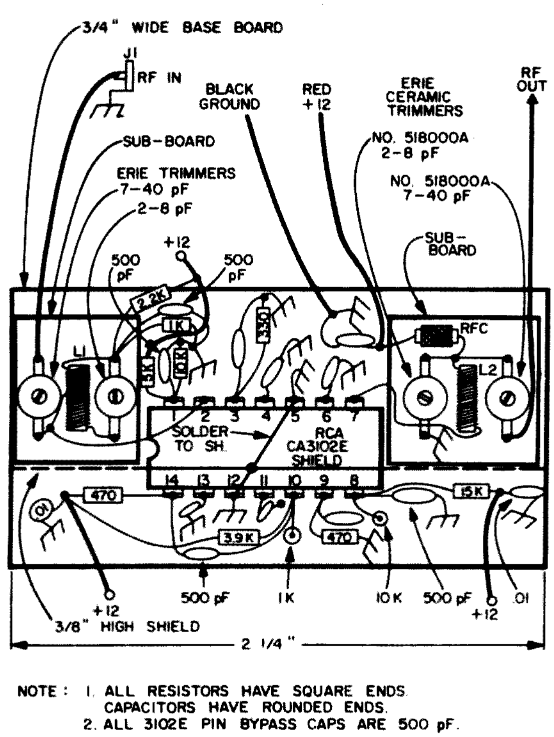
I have a Black and Decker ¼ inch drill with their drill stand, which is very useful in this work. You have to get a jeweller's chuck to handle those little #60 to #80 drills. As mentioned, you cannot get very far into subminiaturization without special tools. I use various kinds of small tweezers, small screwdrivers filed into different kinds of points, jewellers pliers and cutters galore, very small files, and several box frames 4 to 6 inches high to bring the work up near your eyes for use with the magnifying glasses. Also masking tape to hold the small baseboards down on the box, #22 five core solder, a separate small iron for the hot wax, a good micrometer, and a good but small drill vise (in fact, two sizes of these). Just in case you haven't met this handy item, Fig. 2B shows an outline. *Very* handy also for soldering plugs, jacks, and all sorts of small work. "A good workman is known by his tools."

Steel measuring rules and miniature T squares help also. With the items on this list you can at least make a start.

Tuning Elements

Not having found any tuneable coils of 3/32 diameter at a reasonable price, I went to small ceramic trimmers. And found they were not obtainable at a reasonable price either! This is mainly due to the difference between "radio" components and military ones, and the fact that certain special small parts such as ceramic trimmers, are not made in sufficient quantity (millions) to get the price down to where us amateurs can buy lots of them. Also, radio parts only have to last long enough to get out of the retailer's store, while the military ones have to last long enough to become obsolete, which

is not the same thing. And some suppliers, as you probably know through experience by now, do not differentiate between these two grades unless you insist. The Erie Co., 644 West 12th St., Erie, Pa., Tel. 814-453-5611, makes ceramic trimmers which are small, part #518, 2.5-9. The 2.5-9 refers to the minimum and maximum pF, which works well at 147MHz. The price is a horrible $4.95 (per one ea.) which sounds like a top military price to me, and is for those, which are only .218 in diameter. For a diameter of .375 you only pay $1.97 (by onesies). You can see from this where subminiaturization will lead you, dollar-wise! However, don't think you can inexpensively avoid tuning. I do know how to do it (another "breakthrough" article coming up if lucky) but that one is a *lot more* expensive! Believe me, when, and if, I find a way to do it at a reasonable price, I will certainly tell you right away.



NOTE: 1. ALL RESISTORS HAVE SQUARE ENDS. CAPACITORS HAVE ROUNDED ENDS.
2. ALL 3102E PIN BYPASS CAPS ARE 500 pF.

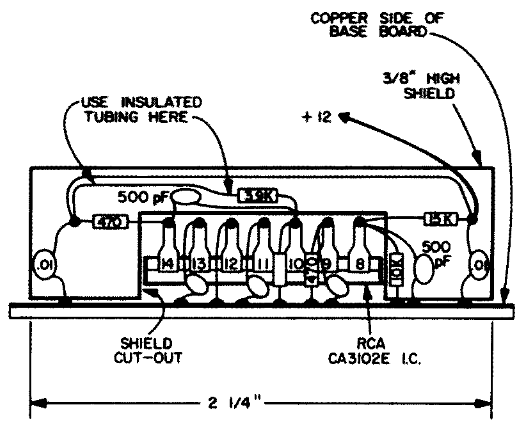
Fig. 3. Layout, rf amp, top view. Scale approx. 2 to 1.

Coils

Very little to say here because this is one of the easier things you have to do. I just took a piece of spaghetti 3/32 in diameter and wound on some turns of #34 DCC (double cotton covered. Enamel will do.) and that was it. Of course, there might be some slight widening of the selectivity curve skirts at rf, but probably not even noticeable. And the gain was very close to the larger coils generally used.

Layout

Here we get into some of the real nitty-gritty work. Fig. 3 shows a top view of the double-compound amplifier of Fig. 1, for Two Meter FM. You will have to work hard at this one. I'm just assuming however, that if I can do it at 69, so can you at N years old. Figure 4 shows the pin 8 to pin 14 detail for that side, and Fig. 5 shows the pin 1 to pin 7 side. I put in all the bypass capacitors first, then the resistors to ground, then the +12 resistors.

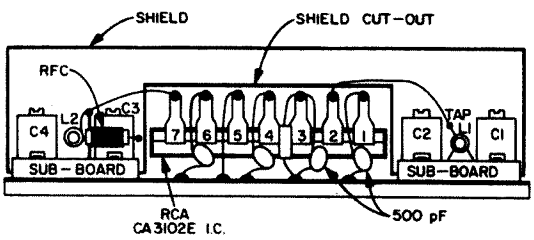


NOTE: ALL PIN BYPASS CAPACITORS ARE 500 pF.

Fig. 4. Layout, pin 8 to pin 14 side. Side view.

The two sub-boards each contain two trimmers, one coil, and six tie-points, as seen in Fig. 3. These can be assembled and wired before or after cementing in place. If you use the common pin method be sure and put insulation, 005 mica or fiberglass, or good linen base bakelite (phenolic) sheet between the sub-boards and the copperclad baseboard, to prevent the pinheads from shorting to ground. Use high-Q coil cement, or hot wax if it is an experimental job like all mine are. If you use the tie-point method of Fig. 2, you do need the insulating sheet. I also use hot wax to keep the +12 lead in place along the shield, or along the baseboard. As I look at it here on the working model, there is only about 4 inches total of it. I used #30 plastic covered subminiature wire.

Leads and wire dress. The base input lead from pin 2 to the tap on L1 should be carefully routed around C1 and kept short. That is about the only rf lead of any length in the whole layout. In my working model here that lead is only 5/8 inch long. Check also with the next paragraph, which has pin detail, and dc voltage readings when



NOTE: SOME PARTS NOT SHOWN ON THIS FIGURE FOR CLARITY. REFER TO FIGURE 3 (TOP VIEW), AND FIGURE 1 (SCHEMATIC).

Fig. 5. Layout, pin 1 to pin 7, side view.

running properly. Make the wire lead and capacitor from pin 14 to pin 10 short, and close to the shield and/or baseboard. All bypass capacitor leads should be no more than about 1/32 to 1/16th of an inch long, as can be seen in Figs. 4 and 5.

Pin detail and dc voltage reading. Pin 1, the base of Q2 is shown separate in Fig. 3 for clarity. Referring to Fig. 1 for all the following, pin 1 has a 5K resistor to +12 and a 10K to ground as a voltage divider. On a VTVM I find 7 volts dc. Pin 2 is the base and rf input to Q1, with a 2.2K to 1K voltage divider, and 3.4 volts. Pin 3 is the emitter of Q1, 1K to ground, and 2.5 volts dc. Pin 4 is not used but is bypassed. 0 volts. Pin 5 is grounded to the baseboard and has a crossover wire to pin 12, and is also soldered to the shield. Pin 6 is the collector of Q6 and is not used, but is bypassed. 0 volts. Pin 7 is the collector of Q5, and is the rf output pin. 12 volts.

Pin 8 is the base of Q5, biased and bypassed. 10K to ground and 15K to +12. 4.1 volts. Pin 9 is the emitter of Q4. It is bypassed and has a 470 ohm resistor to ground. 1.6 volts. Pin 10 is a very important one, the base of Q4, and is the input to the second cascode amplifier, with 1K to ground and 2K to the +12. Has 2.3 volts dc on it.

Pin 11 is bypassed and not used. 0 volts. Pin 12 is an internal shield and is grounded to baseboard, and to the shield by the crossover strap to pin 5. 0 volts.

Pin 13 is the collector of Q3, not used but bypassed. 0 volts. Pin 14 is the output collector of Q2, in the first cascode amplifier. 10 volts dc.

Testing

For almost all receiver work, a pair of 6 volt "lantern batteries" do quite well on the bench. I always have several sets of these around, with a switch and 100 mil meter in series. On applying 12 volts the CA3102E, biased for best operation, will show between 20 and 25 mils total. Looking at Fig. 1, one would expect that there would be a certain balance of current in each of the compound amplifiers. That is, the total current depends on the two base bias voltages plus the emitter self bias of Q4 and Q1. The values shown are for maximum gain, plus stable operation with no feedback showing, or any trace of self oscillation. A slight variation may be found in the final emitter resistor of Q1 and in the voltage divider of Q1, which wound up as 3.9K instead of 2.2K. With the rig running, I would advise checking these two components. There is nothing critical there, just a few db more or less of gain. Use lower current for a better noise figure, in general. I used my trusty infinite-attenuator-generator on these tests (look in 73 magazine naturally!) and found that the gain of this small coil and component rig previously shown in 73. Use a tuned diode detector to be sure of the frequency, and also that there is only one frequency in the output! This would be the case where self-oscillation existed. This would generally show up as current in the ouput, but not always. Sometimes the application of a signal will trigger those nuisance voltages. It is a good thing to *listen* to the output also by means of an af amplifier plugged in on the diode output.

Conclusion. A subminiature I.C. double compound amplifier, that is, two cascodes in series, for use as an rf amplifier for Two Meter FM with minute detail on obtaining and using small components. Further articles, on subminiature front ends and single conversion if sections may appear later in 73. Keep reading, of course.

. . . K1CLL

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Easy-Way TOWER

A recent survey of towers disclosed that prices began at fantastic and then ranged upwards! Perhaps this is one factor that keeps large numbers of amateurs from putting their beams up there where they do the most good.

One tower material that hasn't been adequately explored is that electrical standby—thinwall steel tubing—otherwise known as EMT. This material is cheap, light, strong, galvanized, and easily worked. It's price makes it an attractive tower construction medium.

In the "Thinking about a tower" days, all kinds of questions arose, such as: What shear and compression forces are involved? What bending moments are acting on a section? What icing load will it stand? Not having access to much tower design information, I proceeded to weld (braze) up a ten foot section. See Fig. 1. Placing saw horses under the ends and sitting 300 pounds of people-weight on the center of the span hardly caused it to sag!! This empirical experimentation convinced me this was strong enough for amateur use. Other desirable features on my list included: (A) light-weight construction, (B)

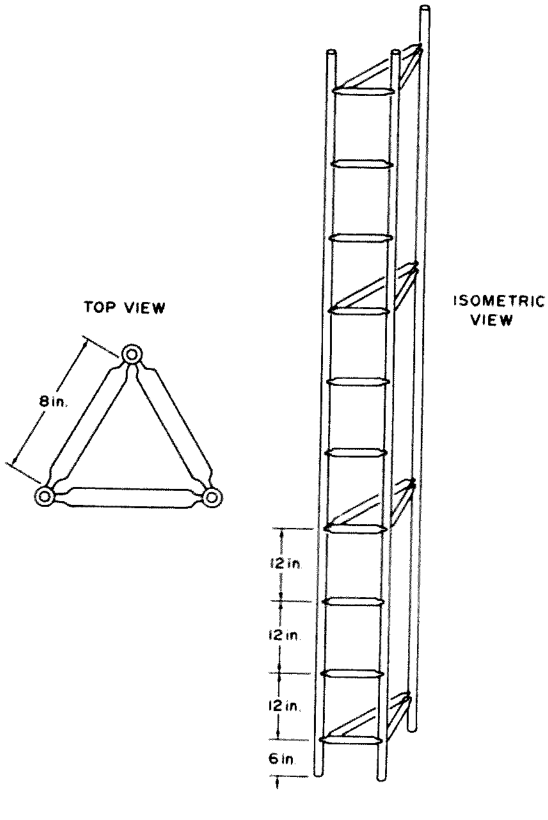

Fig. 1. Basic Building Block.

safe to climb, (C) a built in ladder, (D) reasonable cost.

The exact cost of building a tower depends on several variables, many readers know how to weld (braze), and have access to the required equipment. Others have a brother-in-law or friend who can be called upon to do the job. If not, the services of the local garage or metal working shop can be sought.

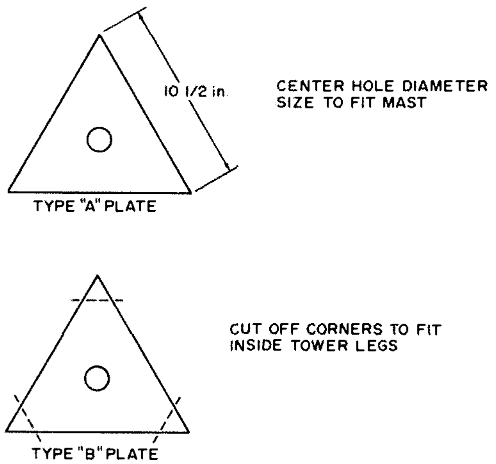

Fig. 2. Plate.

Metal Work

Fortunately this type of construction keeps outside metal work to a minimum. The builder will have to obtain three plates as shown in Fig. 2. These plates are of one-eighth inch iron and of the dimensions shown. Referring to the Table, determine the necessary number of connector plugs for your desired tower height. These connector plugs are made from ten inch lengths of ½ inch water pipe. See Fig. 3. The outside diameter of this pipe is slightly too large to slip into the tower leg tubing. Chuck the connector plug section of pipe in a lathe and take a cut each way from center as shown. Leaving the shoulder in the center of the plug keeps it centered when you join two legs together. Tower sections are joined by drilling through the tubing with plug inserted, and bolting with ¼ inch galvanized stove bolts. Use two per tower leg.

TABLE "A"

number of sections	spacers	EMT lengths	plugs
1 – 10'	18	3	0
2 – 20'	36	6	3
3 – 30'	54	9	6
4 – 40'	90	12	9
5 – 50'	144	15	12

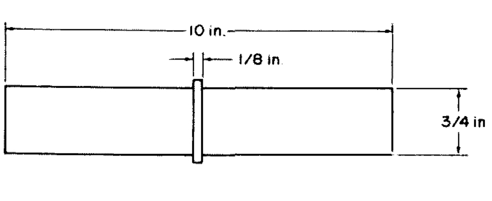

Fig. 3. Connector Plug.

Basic Building Block

Fig. 1, is a drawing of the building block tower section. It requires three (3) ten foot lengths of EMT, and 18 spacers each eight inches long. After cutting the spacers to length, grip the last ¾ inch of the spacer in a vise and crush the ends *almost* flat. Use care to position each end of the spacer for crushing so that the flat ends are parallel. This permits snug fitting of the spacer against the tower leg for welding. A couple of trials and you'll produce perfectly formed spacers every time.

Now, with a felt tip pen, mark 2 of the ten foot lengths of EMT at a point 6 inches up from the end, and each 12 inches thereafter. These marks will indicate the center of each rung for the ladder side of the tower. A simple jig for holding everything in alignment is shown in Fig. 4a. It consists of 3 pieces of scrap 2x4 lumber, each piece about 14 inches long and bored for 1 inch diameter holes, spaced on 9 inch centers. (Make 4, as the extra jig will be used later to hold the third leg.)

Slip the ends of the previously marked EMY tubes through the end pieces and "runner," of the jig. With a carpenter's square position the tubes so that the ends are in square alignment. Weld the first rung. The "runner" is slid along the tubing just ahead of the rung being welded. It helps to keep everything rigid during the brazing process. Choose a fairly level place to work. I welded my sections on my concrete driveway.

When the ladder section is finished, slip a jig piece over *each* leg of the two ends of the ladder section, (see Fig. 4b) and thread the third length of EMT through both free holes at each end. This positions the third leg for welding the spacers between it and the ladder section. As can be seen from Fig. 1, the spacers are placed at the first, fourth, seventh and tenth rungs. This now completes a section of the basic building block. As many as are required can be fabricated. Construction will be speeded up if all connector plugs were prepared before welding began. When the first section is finished, insert the connector plugs and use

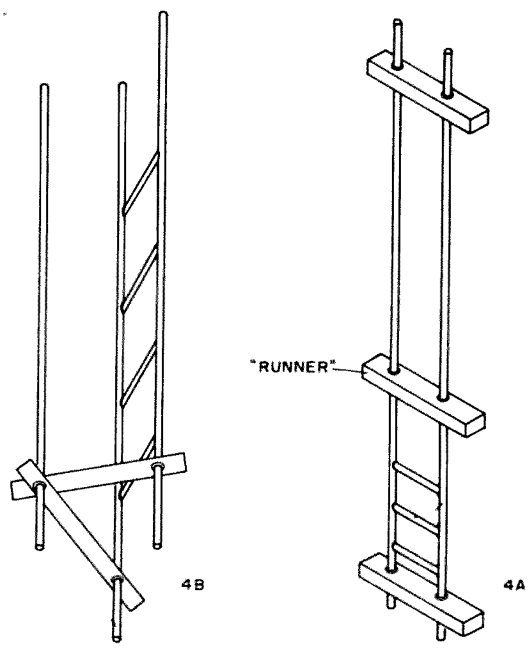

Fig. 4. Ladder.

the finished section as the jig for one end of the new section being built. This speeds things up considerably.

Top and Bottom Plates

When the desired length of tower has been fabricated, the tower is finished by the addition of a type "A" plate welded to each end. A type "B," lateral thrust plate, is welded three and one half feet down from the top plate. This positions it atop the second set of spacers.

Erection

Due to the light weight of this type construction, erection is easy compared with many other types. For a 40 or 50 foot tower, a couple of men on the guy wires will allow one man to walk it up. Three guy wires should be attached. With two people holding the forward guy wires, and the 3rd guy wire (the one that's behind the man walking the tower up) temporarily anchored —the tower can be raised with safety. I usually drive a 6 foot ground rod (½ inch water pipe) at the center of the tower location, leaving 4 inches protruding from the earth. By fitting this stub of pipe into the hole in the base plate as the tower is started up, it will solidly anchor the tower base. After the tower is in place, a ground strap is connected from the tower leg to the earth rod for lightning protection.

Durability

After completing the tower, wire brush and inspect all the brass to steel welds, and touch up any that may require it. Then wash thoroughly with a bucket of warm detergent. When dry paint with a good grade of aluminum fence paint. With these precautions, your tower will last indefinitely.

The last trip up for inspection was in 1972, and my 190 pounds felt perfectly safe although minimal maintenance has been taken on this tower.

The tallest tower of this type that I've built was a 90 footer. This monster was erected in one complete length using a 20 foot gin pole. A 20 foot length of pipe was hoisted to the top and a 32 element two meter array brought up and put in place. All that beam weight along with my (then) 150 pounds proved my experimental hypothesis about the ability of EMT to make a suitable tower construction material. My friend, W4EW, had a 100 footer supporting several six and two meter beams along with his 4 bay conical TV antenna. Six of these towers were/are in use in Alabama, and after 10 years of use, none that I know of have failed. Several hurricanes that played havoc with other TV type masts left these towers unscathed. If you want a light strong tower, and have a flat wallet, this type tower is hard to beat.

. . . W4VUO/3

Bill Hoisington K1CLL

LOW-COST INFINITE ATTENUATOR FOR AMATEUR USE

One of the most useful test-equipment gadgets the homebrewer can build is a signal generator. The one described here is of commercial quality and it can be completely contained inside a waveguide. Positioning, by sliding along the waveguide, provides a variable-strength stable signal of one millivolt, one microvolt, one nanovolt, or less, dropping down gradually to a true zero. It does this in a perfectly smooth fashion without steps or jumps so that every fraction of a decibel in lower noise figure shows immediately on the slide dial. What's more, the slide can be calibrated so that FM'ers can use the device for directly measuring receiver sensitivity in tenths of a microvolt.

In building a 6 meter receiver recently for maximum absolute sensitivity I naturally had to check especially on the first-stage rf transistor and circuit for minimum noise figure. (For this type of work you *must* have a signal generator capable of being attenuated out of sight with any receiver you can buy for any money.) The usual generators on the market under $100 do not do this. And many of the very expensive generators get so leaky that they have to be used 200 ft. from the receiver. At any rate, the generator described here can be made up quickly and at low cost, and it *is* stable, reliable, and infinitely variable.

Waveguide

The only possible difficulty might be in obtaining the piece of waveguide needed. The piece I used is 4½ in. wide by 2 1/8 in. high, and is 24 in. long. If you have a choice, get a piece a little longer. You could make up this item out of brass or copper if you had to, because in this case it is not used to *carry* energy but to *attenuate* it, so the worse you make it the better!

The waveguide *must not* have any holes in it and should be reasonably smooth inside because otherwise your dial would not read smoothly in attenuation. You *could* use copper or aluminum drain pipe, although I have not tried them yet. Working directly on rf, this attenuator is good for any kind of modulation, including SSB, FM, Pulse, or what have you.

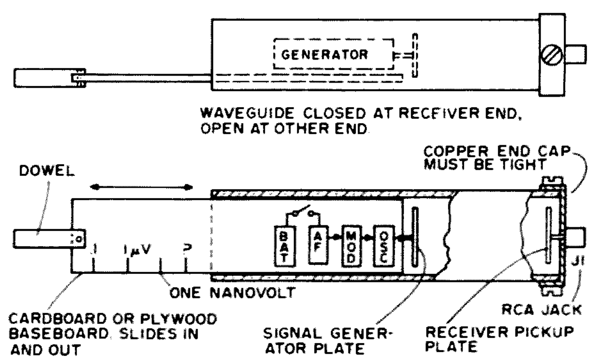

Fig. 1.

Construction

Fig. 1 shows the basic idea. When the signal generator plate is close to the receiver pickup plate, you can get about 100 mV of signal into the receiver, and it is handy for checking diode receivers. When the two plates are about 8 in. apart, the signal is just detectable on a good receiver. Additional spacing between plates amounts to "waveguide beyond cutoff." I do not believe that there is any receiver in the world that can

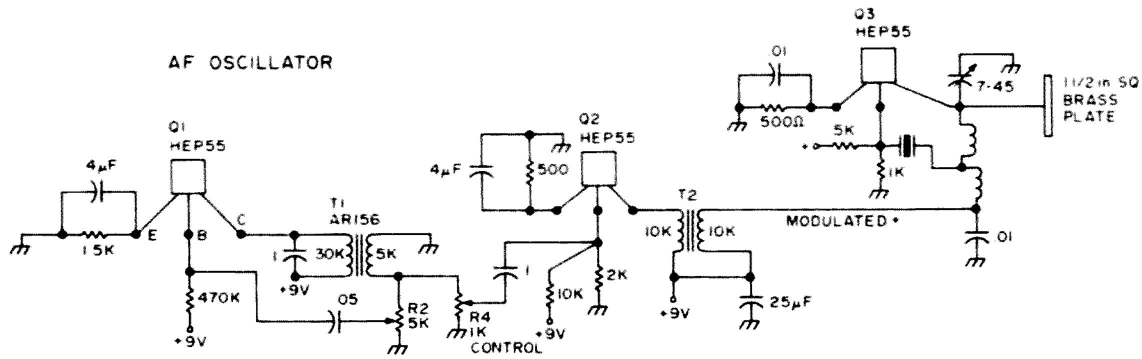

Fig. 2. Schematic of Generator

pick up the signal much beyond the 8¾ in. point.

Pretty soon in your receiver "peaking" work you get to that signal that may be but a tenth of a microvolt or so, and you begin dreaming about cryogenic front ends, masers, and such. As mentioned, every fraction of a decibel lower in noise figure, every improvement in sensitivity comes out rigorously and relentlessly on that slide dial. You can easily check which of your low-noise transistors is really low, whether that MOSFET will do a better or worse job for you, and in which circuit.

As you go up in frequency you may have to make smaller and smaller oscillators in order to fit in smaller waveguides to get the cutoff effect. (That will not be a problem if you read 73; the May issue described a "postage-stamp-sized" rf generator that is an ideal candidate for the signal source.)

Circuit

A crystal oscillator, an af oscillator, and a simple class A modulator do an excellent job to start with. Fig. 2 shows the present unit as used on 6 meters. It must be stressed again that no wire or other piece of metal may be allowed to reach the outside from this assembly. I'm making up another for 2 meters soon (still my favorite band) and will try one on 450 a little later.

Audio

A controlled-feedback transformer-coupled af oscillator does a good job in furnishing a sine wave. A Motorola HEP55 is used for the oscillator, with feedback to the base from the collector through transformer T1, controlled by resistor R2. Audio output is taken off the 5kΩ winding of T1, is fed through R4 the modulation control, and then to the base of af modulator Q2. Transistor Q2 is set up for low-power class A operation because not much modulation is needed for the signal generator. Transformer T2 is an old 5W unit from "tube-type portable" days. The secondary of T2 feeds a modulated +9V signal to Q3, the crystal-controlled 50 MHz oscillator.

This rf oscillator is one of my negative-feedback jobs with phase reversal in the crystal. A 1½ in. square plate is tied onto the collector, radiating energy to the receiver pickup plate facing it inside the waveguide. This energy is rapidly attenuated as you move the plates apart, and should be impossible to detect after some 9 or 10 in. of separation.

Once again, do *not* bring any wires or any other metal or conductor out from the oscillator assembly. If you want an outside controlled switch or other control, bring it out as a wooden dowel handle.

That's about it. Tune everything up outside the waveguide on the bench and when you're satisfied, plug your best 6 meter receiver into J1, push the oscillator plank along the waveguide (or rather I should say pull it along) away from J1. You'll get a surprise! Hope this helps you with your low-noise receiver work. It did a lot for me.

. . . *K1CLL*

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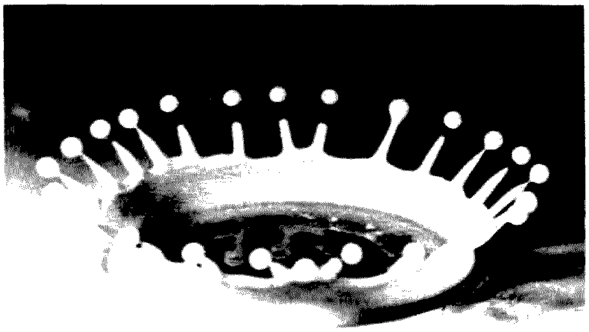
Lightning In A Bottle

flashtubes

Electronic flash has long since come into its own with a wide variety of applications ranging from photography to theatrics. In spite of its wide range of exploitation, however, it seems to have attracted relatively little interest to the experimenter. Considering the simplicity of the circuitry, it is something of a shame that this field is so neglected.

Whether taking a picture, activating a ruby laser, or freezing motion, the principle and circuit is basically the same. The lamp itself consists of a glass or quartz tube filled with a rare gas. In photographic applications, the gas is usually xenon, which produces a spectrum approximating that of daylight. The tube is connected across a large capacitor which is charged to a high voltage. When a high voltage pulse is applied to a triggering electrode – a conductor in close proximity with the lamp envelope – the gas inside ionizes. Upon ionizing, the resistance of the gas drops to almost a short circuit and the capacitor discharges producing a brilliant flash of light.

The power consumed by a flashtube is usually measured in watt-seconds – the number of watts drawn by the load times the number of seconds the lamp is lit. The average amateur flash unit runs about 25 watt-seconds. This may seem small until you



Milk drop making crown effect.

consider the flash only lasts about 250 microseconds. A 25 watt-second lamp, if it burned steadily, would consume 100,000 watts! You don't believe it? Okay. Here's where I got the number. 250 microseconds equals 1/4000 seconds. To deliver 25 watt-seconds in that amount of time, the instantaneous power consumption must be 25 x 4000 or 100,000 watts!

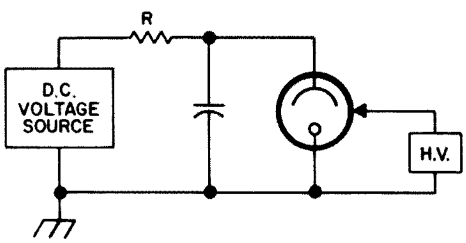


Fig. 1. Basic flashtube circuit. Generally, the dc voltage is in the order of 400 to 1000 volts in photographic units. The high voltage triggering impulse averages around 4 to 5 kV. The triggering electrode is in the form of a thin wire wrapped around the outside of the tube. In some photoflash units, the reflector also serves as the triggering electrode. Resistor R presents overloading of the dc supply as the capacitor recharges, and delays recharging of the capacitor long enough to let the lamp cool.

The amount of light delivered by the lamp, however, is a different matter. It depends not only on the power consumed by the lamp, but on the form factor of the lamp and the type of reflector used. The intensity of the light in the center of the beam, expressed in candle power, is multiplied by the duration to give a figure called beam candle power seconds. This figure, which is an accurate expression of the quantity of light, is what the photographer needs to properly expose his film. Amateur units average around 1,000 BCPS. A thousand beam candle power seconds crowded into 250 microseconds has an instantaneous brilliance of four million candle power!

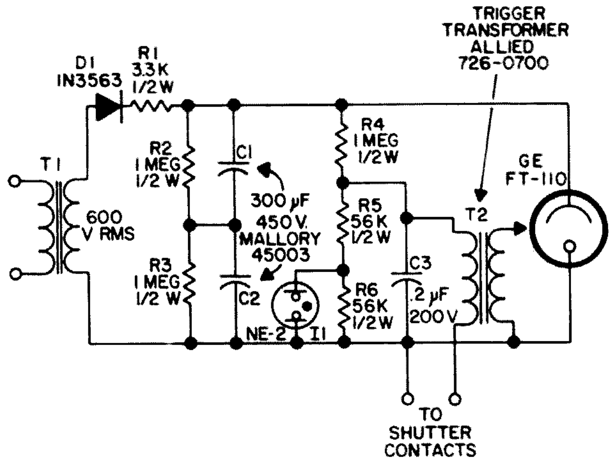


Fig. 2. Here is a workable 100 watt-second photoflash unit. It uses the ac supply, and the mallory capacitors are monsters in size. Selection of newer type capacitors and replacing the transformer T_1 with a solid-state chopper circuit will result in a more nearly up-to-date battery-powered unit.

As mentioned earlier, the circuit is very basic. The anode voltage for the lamp is provided either from the ac supply or from a battery through a transistor chopper circuit by a simple half wave rectifier. The triggering pulse is usually provided by discharging a capacitor through a small transformer not too much unlike the flyback transformer used in TV applications. A resistor in series with the diode limits the capacitor recharging current to within the ratings of the diode.

The watt-second rating of a flashtube circuit is determined by the combination of voltage and capacitance, using the formula

$$J \text{ (Watt-Seconds)} = \frac{1}{2} E^2 C$$

where C is expressed in microfarads and E is expressed in kilovolts. For example, using a capacity of 800 microfarads and 400 volts,

$$J = \frac{1}{2}(0.4)^2 \times 800,$$

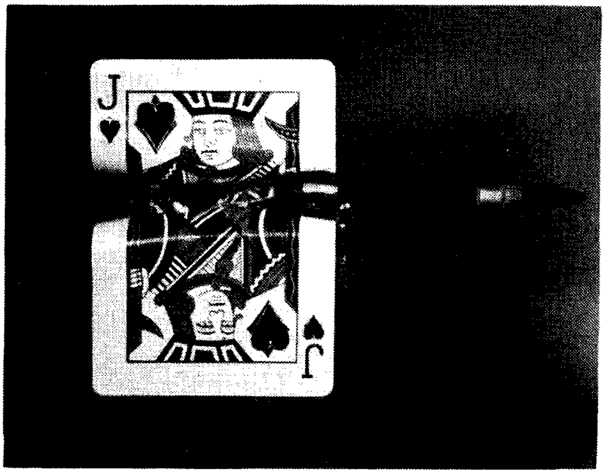
or

$$\frac{1}{2}(0.16 \times 800),$$

or

64 watt-sec.

In the formula, the letter J, which usually stands for joules, represents watt-seconds. A



The Jack of hearts- he had no tarts.

joule is equal to one watt-second. In computing the power, we are actually calculating the energy stored in the capacitor. The term "watt-seconds" is preferred by those who work in the electronic flash-field.

Figure 2 is a diagram of an ac powered flash unit. Although quite operational, its large size puts it into the category of yesteryear. It is, however, about four times as powerful as the small units that fit on top

RADIO SAFETY

A careless technician named Cleever,
Went to work on his FM transceiver.
This unfortunate lug
Failed to pull out the plug,
Leaving his poor XYL a griever.

A DX'er from North Carolina
Thought his antenna couldn't be finer.
Till he looked at the roof
And discovered the goof:
His quad had quashed an airliner!

A dim-witted novice we know
Strung his long-wire somewhat too low.
A neighbor, while joggin'
Lost most of his noggin
Leaving our friend a heady memento.

A curious chap from Tangier
While adjusting his high-powered gear,
Left the cover unsaddled
As he tuned and paddled,
Thus ending his hamming career.

A DX'er with rig over-powered,
Tried to chat on the air as he showered.
He CQ'ed and CQ'ed,
Till quite barbequed;
(Obviously, the tub had to be scoured)

K4ADL

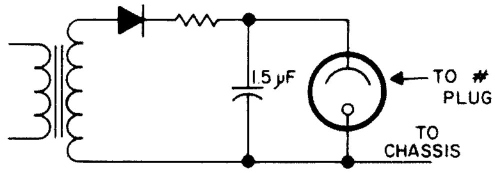
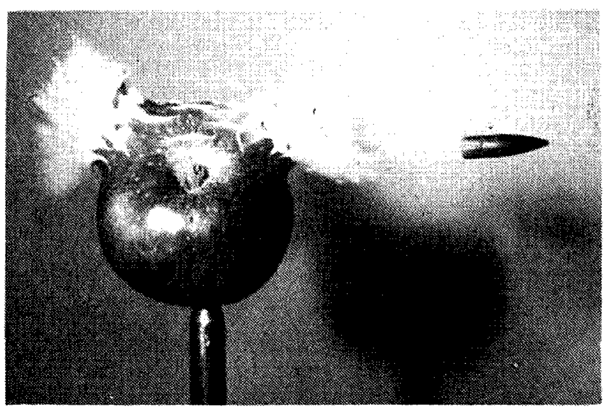


Fig. 3. Reducing the capacity to reduce the watt-seconds enables rapid repetition. Firing the lamp from an automobile's ignition system changes the flash unit to a timing light.

of your camera, and is basic enough to demonstrate the principle. The energy storage capacitors, C_1 and C_2 are connected in series as the maximum available voltage rating in electrolytic capacitors is limited. Resistors R_2 and R_3 equalize the voltage across the capacitors.

All parts to the right of the energy storage capacitors are housed in the flash



High speed camera catches apple passing through bullet.

head. R_4, R_5, and R_6 form a divider to supply the proper voltage to ignition capacitor C_3. As the charge in the energy storage capacitors reaches the proper level, lamp I_1 lights. When the shutter contacts close, C_3 discharges through the primary of T_2, supplying a high-voltage pulse to the ignition electrode to fire the lamp.

Since the action that initiates the ignition process is a contact closure, a wide range of tricks are possible. The contacts need not be in the camera. They can be in a relay, or the circuit can be completed by a thyrotron or solid-state switch. By using a microphone to pick up the report of a gun and triggering the flash from the amplifier output, a bullet can be frozen between the weapon and the target. A photo relay can trigger the flash as a falling drop passes. A little time delay in

the circuit can produce some interesting patterns by freezing the drop as it strikes the surface.

For another application, if the watt-second rating of the lamp is reduced, rapid repetition of the flashes can be done without driving the lamp to self-destruction. By reducing the capacity to within the range of non-electrolytic types, the power of the unit can be reduced to one watt-second. Now, if the triggering coil and associated parts are eliminated, and the ignition electrode connected to the No.1 spark plug of an automobile engine, the unit becomes a timing light. The lamp fires each time the plug fires, freezing the motion of the flywheel so that the timing mark can be seen. Enough said if you are an automobile bug.

With the lamp's energy reduced to permit rapid firing, we find another application. By running the output of a tunable sawtooth wave generator through a flyback transformer and using the resulting power to fire the lamp, we have a calibrated rate of flashing which is useful either for stroboscopic timing or to blow the mind psychedelically. I must admit here that my strongest point with flashtubes is in single-flash applications such a photoflash or laser applications. If you want to build a strobe light, you will need to experiment to find the best type of flyback transformer to ensure that you have the proper voltage for your lamp. The principle, however, is as represented here. For extremely fast operation, you may need to select your lamp from several. I've been informed that stroboscope manufacturers make their own lamps. G-E, however, has several that are specifically recommended. Namely, FT-230, FT-151, FT-524, and FT-91. Having presented the principle, I leave the rest up to you.

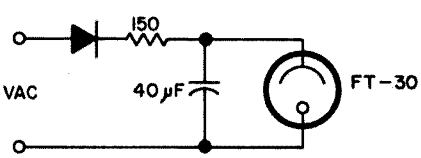


Fig. 4. However, G-E recommends the FT-30 for this purpose. Since this lamp operates at a much lower voltage, the circuit is much simpler, but the flash is longer in duration.

The theatrical, or psychedelic application is the most recently popularized and one of the most publicized use of a rapid-repeating flash unit. Generally, the same type of unit is used in this application as in scientific applications, the repetition rates being adjusted to the individual user's taste. You may find a rate somewhere between ten and fifteen flashes per second most effective, as there is a point within that range that will interfere slightly with brain impulses and drive you right up a wall. It isn't dangerous unless you overdo it though.

Whatever your favorite application, there is, in the relatively simple circuitry of the electronic flashtube, a vast potential for many a fascinating evening. I will add one precautionary note for any beginner working with large capacitors charged to a high voltage. If you get across a fully-charged capacitor, it can kill you. Careful!

. . . W2FEZ

Books:

General Electric Flashtube Data Manual

Flashtube Engineering Manual (Allied cat. No.726-0100)

The Way Things Work Simon & Schuster, New York

Professional Photographic Catalog

PARTIAL LIST OF FLASHTUBES

TYPE	Max. anode voltage	Max. watt-sec. input	Min. flash voltage	Trigger pulse
G.E.				
FT-30	500	10	120	10 kV
FT-106	315	50	250	4 kV
FT-110	1050	100	800	4 kV
FT=118	550	125	400	4 kV
FT-218	1050	200	800	4 kV
Honeywell				
AF202001	260	16	210	4 kV
AF202002	360	24	220	4 kV
AF202003	400	28	210	4 kV

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Imperial Beach CA 92032

Modernizing The SELECT-O-JECT

Chromed bumpers, padded knobs, emission controls and oh yes, op amps.

Various forms of the select-o-ject have been around for quite awhile. This is device which can either peak or notch a tunable audio frequency. Older versions of this device suffered, however, from a drawback which rendered them somewhat inconvient to use. The gain and the tuned frequency interacted in such a way that a two-handed approach to the beast was necessary, an unhandy trait during the best of contests. The above remarks held for both the vacuum tube versions, and the solid state versions, and for much the same reason, which we shall explore here. This article describes a scheme for putting together a select-o-ject in which the three variables of overall gain, tuned frequency, and notch depth – peak height, are all quite independent. To fully benefit from this article, the reader is strongly urged to review the operational amplifier articles which have appeared in the August 1970 issue of QST.

Fundamental Concepts

The fundamental idea behind the select-o-ject is sound enough. A circuit is contrived which exhibits a frequency-dependent phase shift, such that a shift of 180° occurs at only one (tunable) frequency. If now the unshifted incoming signal is added to the output of the shifter, the device will exhibit a notch at the tuned frequency, the perfection of which depends directly on how well the two amplitudes are matched. On the other hand, should the incoming signal be added in phase to the output of the shifter, the result will be a peak in the response of the device at the tuned frequency, much in the spirit of the "Q-multiplier" concept.

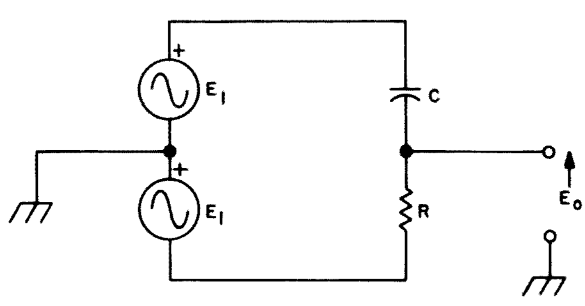


Fig. 1. The basic phase shifter with constant amplitude characteristics.

To understand the source of the difficulty with older versions of the select-o-ject, and to fully understand the operation of the modernized version presented here, we turn our attention to Fig. 1, which shows the basic shifter. It is necessary to have the two sources shown, so that the output is constant in amplitude. The little + signs indicate the relative phasing of the two sources, which are presumed to have zero source impedance. The ouput is unloaded. Under these conditions, the ouput/input characteristic of the circuit is given by:

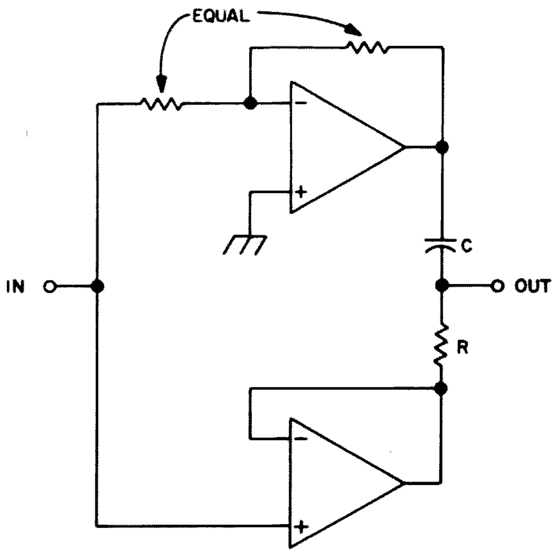


Fig. 2. Showing the implementation of Fig. 1, using operational amplifiers.

$$(1)\ G = \frac{E_0}{E_1} = \frac{x - j}{x + j}$$

$x = \omega RC,\ \omega = 2\pi f$

This is easily derived by those handy with phasor algebra. From equation (1) we can easily list the important traits of the circuit of Fig. 1.:

1) When x is 0, G is 1 at 180°
2) When x is 1, G is 1 at -90°
3) When x is infinite, G is 1 at 0°
4) When x is anything at all, the absolute magnitude of G is unity as advertised.

The conditions of zero source impedance and unloaded output are very important, as any departure from those conditions will upset equation (1) beyond recognition, and completely eliminate the four characteristics listed above.

In older versions of this device, the sources of Fig. 1, were obtained by splitting the incoming signal equally between the plate and cathode, or collector and emitter, as the case may have been. Unfortunately, the requisite load resistors at either end of the active device used, resulted in a non-zero source impedance, and finite output loading. This is the reason for the oddly large values of the resistors which are shown in transistor circuits.

With the advent of low-cost operational amplifiers with pretty close to ideal input-output impedance characteristics, the circuit of Fig. 1, can be approached a good deal more closely, in the real world. Fig. 2, illustrates how this is done. In Fig. 2, and in the rest of this article, all op-amps are drawn in what has become the "standard" orientation, with the inverting input at the top, as indicated by the - sign (the non-inverting input being indicated by a + sign). Power supply connections and dc balancing details are omitted for clarity. Comments on these

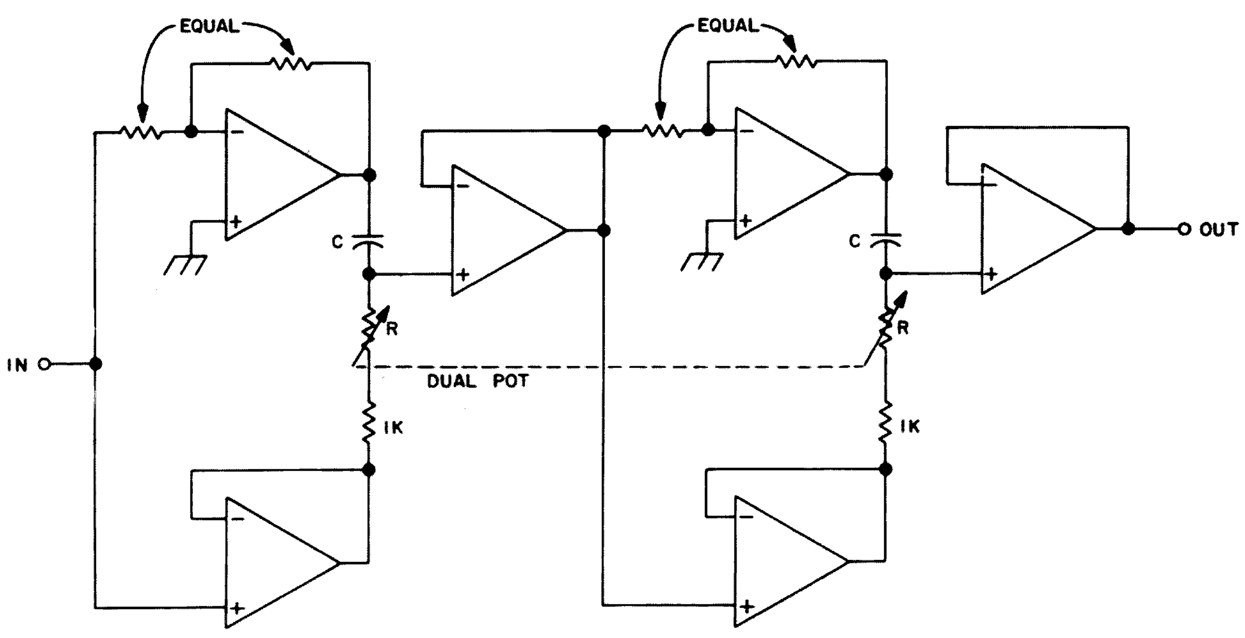


Fig. 3. The phase shifter portion of the modern select-o-ject. Parts values are discussed in the text.

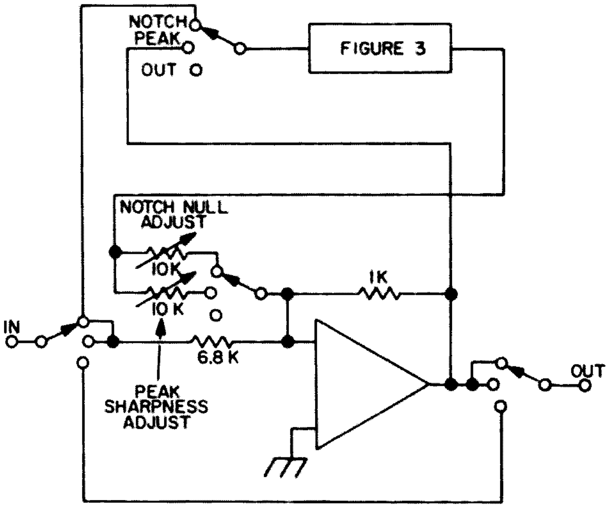


Fig. 4. The complete modern select-o-ject.

two aspects will occur at the end of this article.

Now Fig. 2, will provide a 90° phase shift at the "center frequency" where, from the second of the four traits listed above we can write:

$$x = \omega_0 RC = 1,$$

or:

$$\omega_0 = \frac{1}{RC}$$

The o subscript indicates that this is the particular frequency to which the device is tuned. But 180° is what we seek. So, the circuit of Fig. 2, is duplicated. An extra op-amp is interspersed, used as a simple gain-of-one voltage follower, to take advantage of the high input impedance which will not upset the action of the first stage of the shifter. The reader may be getting the impression that our modernized select-o-ject is going to gobble up scads of op-amps, to which we remark that op-amps are cheap enough these days, and the device will use very little else. As a matter of fact, the total component count is surprizingly low.

We turn our attention then to Fig. 3, which shows the complete schematic for the tunable 180° shifter portion of the select-o-ject. Before proceeding with the application of Fig. 3, to a modern select-o-ject, this would be a good time to discuss part values for this portion of the device. Some things are important and some are not. The use of op-amps automatically takes care of the important matter of source and load impedances. It is important that each pair of resistors are equal, as shown in Fig. 3. It is not important what their exact values are. The reason is so that each "source" op-amp has a gain of unity, which provides for the equal voltage sources of Fig. 1. The author had some 2.2K precision resistors, and used them. Other matched values should work as well. Values betweeen, say, 1K and 100K should work all right, and matching with a good ohmmeter should suffice. In like manner, the exact values of the tuning components, consisting of the two capacitors, and the dual pot, are not important. It is important that the two capacitors be reasonably close in value. The author happened to have a dual 25K pot, and some quick arithmetic with equation (2) showed that values for the two capacitors of 0.1 μF would give a range of tuning of about from 80Hz to 5000Hz. In practice, it turns out that the tuning range is inconveniently compressed at the high end with linear tuning pots. An "audio taper" dual pot would probably present procurement problems and the author did not bother to obtain one. Instead, empirical experience with the device led to a reduction in the values of the Cs to 0.047 μF, which brought the tuning range down to a reasonable "swing" of the dual pot shaft, at the expense of the low frequency end. But then, one seldom has need to use a select-o-ject down around 200Hz and lower anyway. Finally, a couple of 1K resistors were added in series with each dual pot section, as shown. This was to prevent the reduction of the resistance of the tuning pots to zero, which event leads to a severe degradation of performance.

The Complete Select-o-ject

We are now in a position to describe the complete select-o-ject. There are a variety of ways to provide for the feeding around and adding/subtracting of signals. The author tried several schemes, and although they all do have academic interest, only the one finally settled upon will be described here. It is shown in Fig. 4.

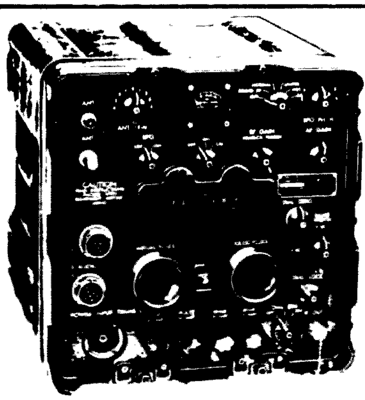
A seventh and final op-amp is used for the "combiner" operation. The mode of operation of the device is selected with a four pole, three position selector switch, which is shown in the notch position in Fig. 4.

Initially, provision for a gain control was provided by installing a pot in the place of the IK feedback resistor around the combiner op-amp. It was found to be an unnecessary feature, however. The audio gain control of the receiver is used for this purpose. Hence, a fixed resistor is installed at this point, as shown.

Also, initially one pot served as both the notch depth and peak sharpness control, but this was found to be most unsatisfactory, since going from one mode to the other required that that control be readjusted, which turned out to be a nuisance. As a matter of fact, in day-to-day use, it is seldom necessary to adjust the notch depth control at all, and if the unit were to be built with this control installed inside, it could be adjusted once and then left alone, a saving of panel clutter would result.

As shown in Fig. 4, one arm of the selector switch is used to select the corresponding adjustment for that mode. When in the notch position, the output of the shifter is added to the incoming signal at the input to the combiner op-amp, and since they are exactly out of phase at the tuned frequency, a notch will be produced there.

In the peaking mode, the incoming signal is applied to the combiner op-amp only, which drives the phase shifter, which in turn provides a signal to be combined with the incoming signal. The phase shifter and the combiner op-amp form a circle in this mode, exactly as is done with the Q-multiplier. Decreasing the value of the corresponding adjustment pot in this mode will progressively sharpen and peak the response, eventually leading to a condition of self-oscillation. It is just before this condition is reached that the device exhibits the maximum sharpness of peak. Of course, one may allow the circuit to oscillate, and use the select-o-ject in "double duty" service as a rough-and-ready source of audio frequencies around the ham shack.



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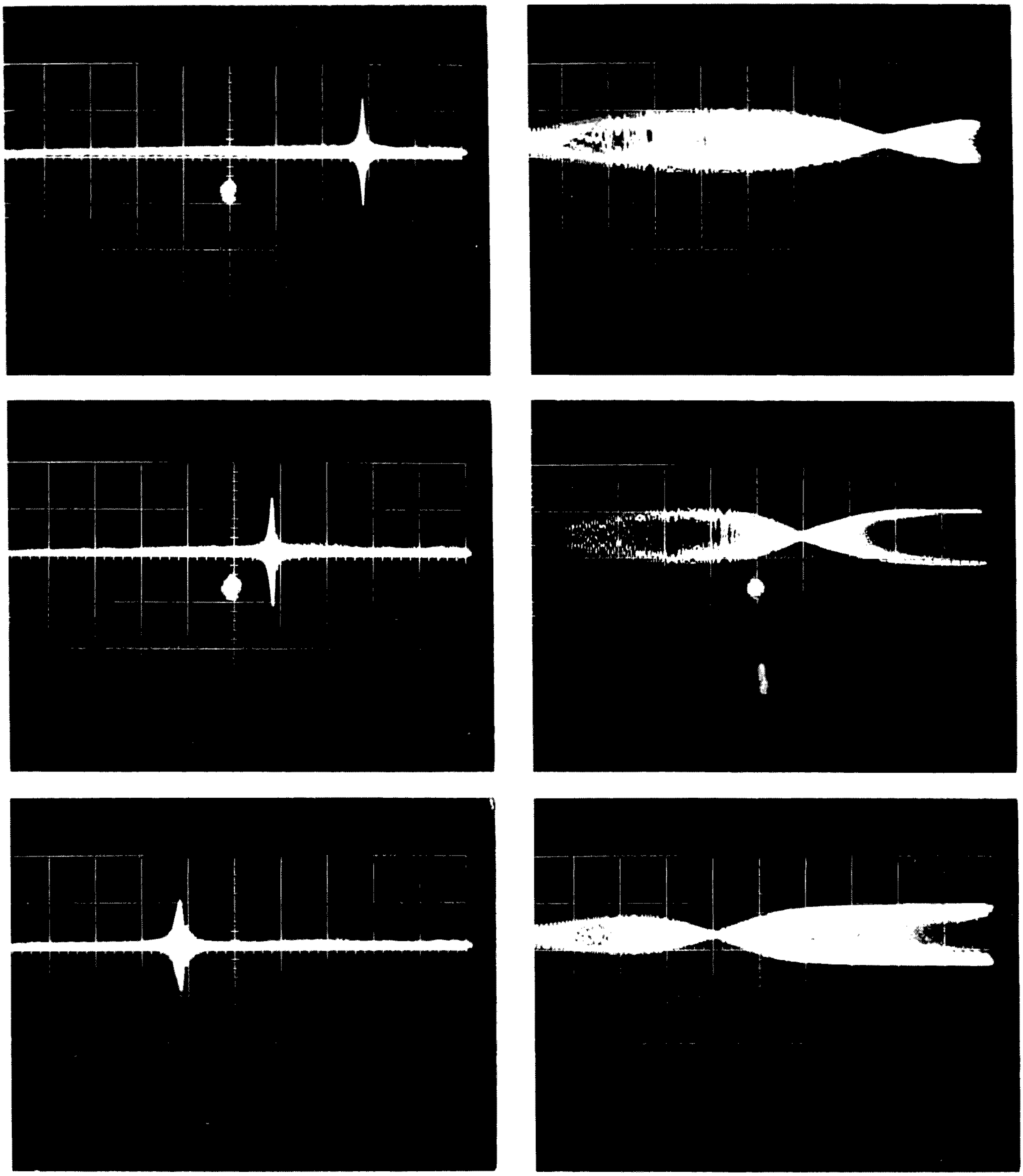


Three pairs of photos taken from a scope showing the output when the unit is switched from Peak to Notch at different frequencies.

In the out mode, the signal is simply routed around the device, as shown.

Operation

The operation of the device is quite straightforward. Plug the input into the headphone jack on the receiver. Place it in the peak mode and advance the peak height control until the device almost oscillates. Swing the tuning pot through its range, and check that the point of "just about to oscillate" on the peaking control does not change. This is the control independence spoken of earlier, and is the outstanding feature of the modern select-o-ject. Now tune in a CW signal and peak it up. Without disturbing the controls, switch the unit over to the notch position. Now adjust the notch control for a null. It will occur at precisely the same point on the tuning adjustment, another of the features which are claimed for this device. If the peaking is first done as

carefully as possible, it will be found that the notch will be capable of completely eliminating the signal. Having made that adjustment of the notching control, again swing the runing control through its range (retuning the receiver in the meantime to provide varying pitches of the applied CW note), and check to be sure that the notch does what it is supposed to do, without further adjustment.

Having accomplished the above, it will be found that operation of the device will consist mainly of doing the tuning. The notch control will not have to be adjusted again, as mentioned earlier, and might as well be mounted inside the unit. The peaking control may be adjusted to suit conditions required. The notch is fairly sharp, and difficulty may be experienced in "finding" it. The easiest way is to peak the unwanted signal first, then switch the unit to the notch mode.

About Op-Amps

And now a word about op-amps. The author used the Texas Instruments type SN72741N in the "minidip" package, because they happened to be available. This device is quite uncritical, and any reasonable op-amp should do the trick. The reasonable means an input impedance of about a meg-ohm or better, an output impedance of 10 ohms or less, and an open loop gain of at least 50 or so. Any modern op-amp should meet these requirements, at least over the audio range, which is the only range of interest here.

The author is in the habit of using a pair of stereo headphones, mainly because they are comfortable on the ears over prolonged periods of time. They have an impedance of 8 ohms, and are driven directly by Fig. 4, without any need for matching.

Fig. 5, shows the power supply used. The exact current requirements will depend on the particular op-amps used. The drain at plus and minus is 15V, using the SN72741N (seven in all) is about 25 mA from each side of the power supply.

Also shown are some photos taken from a scope, with the select-o-ject driven from an audio sweep generator. The sweep was logarithmic, and covered the span from

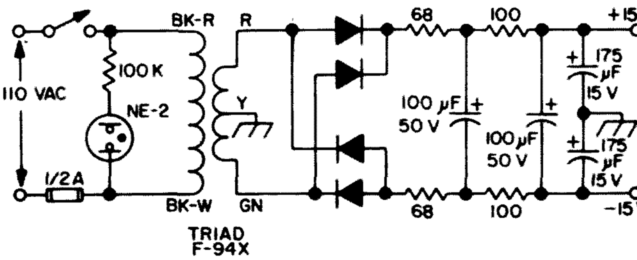


Fig. 5. The power supply for the select-o-ject. The NE-2 pilot light may be an unnecessary frill. The diodes are any convenient rectifiers which have a PIV of about 100V or more, and a forward currant rating of about 100 mA. or more. Good filtering is important, but the exact values of the two output voltages are not, as long as the maximum supply ratings of the op-amps used are not exceeded. A reduction of supply voltages will simply result in a reduction in maximum allowable input signal level. The exact values of the filtering capacitors are not important, the rule here being the more the better. Values shown in the diagram have proven to be adequate.

50Hz to 5000Hz. In each pair of photos, the device was switched from peak to notch without disturbing the tuning control. One sees that the peak and the notch occur at the same frequency. Reading across the triplet of photos, the frequency was tuned to different parts of the audio spectrum, this time without disturbing the notch and peak controls. One sees that the independence claimed holds very nicely here, there being no need to readjust the peaking as one tunes the device. Truly, "one-knob control." In these photos, the dropping off of amplitude at the left hand (low frequency) end is due to the 1 µF capacitor used to couple in the swept signal, and not due to any dropping of gain of the select-o-ject at low frequencies.

Finally, you may have noticed that no dc balancing has been mentioned. The author found this to be completely unnecessary, at least with the particular op-amps used. If this is a problem with other op-amps, the result will be assymetrical "flat-topping" under conditions of very large input signal. Since there is a dc path around the select-o-ject circuit, should this problem arise, it may be taken care of by returning any one of the grounded op-amp inputs to the center arm of a pot connected between the power supply terminals instead.

. . .WA6KGP

Ralph Steinberg K6GKX
110 Argonne Avenue
Long Beach CA 90803

* PROFILE

Roy Alciatore

W5RU

Roy, who was an avid DXer, became a silent key not long ago . . . we thought you might like to read about this enthusiastic and famous amateur in a profile written before his death.

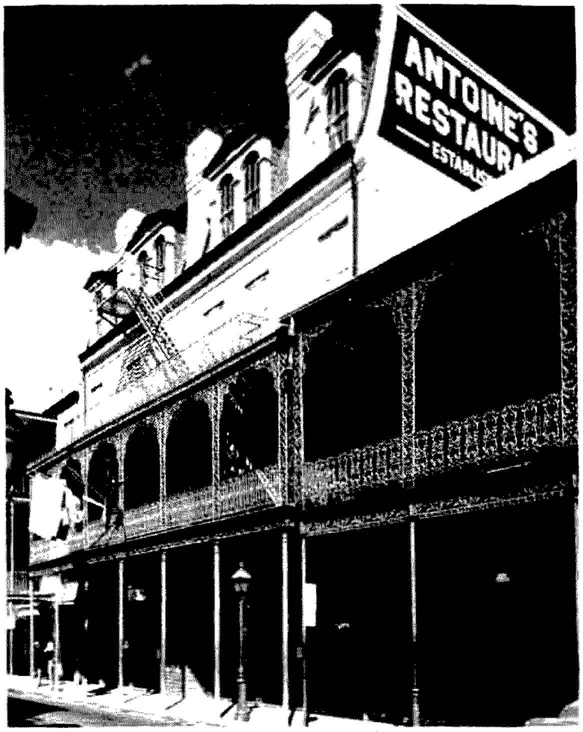
Ham and eggs will not be found on the menu at the famous House of Antoine's in New Orleans, but you will find a "ham" in the person of Roy Alciator, proprietor of this celebrated restaurant.

Roy Alciatore, the grandson of Antoine Alciatore, founder of Antoine's, has been serving famous food to the distinguished gourmets of the world as his father and grandfather had done for more than a century. Presidents, nobility, dignitaries, sports figures, celebrities of stage and screen have enjoyed *Oysters a la Rockefeller, Pompano en Papillotte, Pommes Soufflers,* and *Crepes Suzettes* with *Cafe Diabolique.*

At one time it did not look as though he would carry on the family tradition. It was only through his need of money for radio equipment when a boy that he went to work for his father. Roy was born December 19, 1902, in New Orleans, attended St. Aloysius College from 1913 to 1917, and entered St. Paul's College in Covington, Louisiana the latter part of that year. Here Roy became interested in amateur radio and, through the efforts of Father Martine Barré, physics professor of the school, he learned about the mysteries of radio.

With amateur radio activity at a standstill due to World War I, he was not able to get on the air until after the Armistice. It did not take long then to rig up a model T Ford spark coil and communicate with a cousin two blocks away. For receiving, Roy built a loose coupler from a Quaker Oats box and used a galena cat's whisker detector. For hour after hour, the boys would send messages to each other, hoping for some distant stations to join them. Although they could hear high-powered military and commercial spark stations outside of New Orleans, they did not have any luck making contacts until Roy installed a Zenith Rotary Gap and a Thordarson Transformer with a four wire "flat top" antenna.

Then the fun began, with Roy getting his first amateur radio license with the call 5RH. From then on the rotary gap was working



Exterior view of Antoine's Restaurant. Photographs, Leon Trice Photography, New Orleans LA.

night and day, working DX stations. However before long the radio inspector knocked on his door and gave orders to cut down the power. The rig was putting out two kilowatts and the inspector cut it back to one. With reduced power the rotary gap was still punching holes in the spectrum and station 5RH could be heard several hundred miles away and under favorable conditions, DX contacts were made up to a thousand miles.

Wavelengths were purely accidental during this era of the spark days and wherever the rig loaded or tuned the best was the operating frequency. Most of the high-powered radio amateur stations used from 300 to 1000 meters, while the fellows with limited equipment operated usually from 200 to 300 meters.

In 1922, Roy heard and read about the vacuum-tube which was just becoming popular. He bought a couple of UV-203A tubes and built a 100W rig. Then he got the idea to improve the receiving part of the station and purchased a Grebe CR-8 Receiver. This called for a new antenna and a six wire inverted "L" cage type antenna was installed. When everything was ready Roy tuned the new receiver and there was a station in England and another in Canada calling CQ. He decided to try for the English station first and gave him a call. After an anxious wait of several seconds, the station G5CB returned the call and gave him a report that his signals were very good copy. Roy nearly fell off the chair upon receiving such a nice report on his first overseas contact, especially with a new rig. After exchanging names and addresses for QSL cards, he went hunting for more worlds to conquer and before the night was over had worked several more stations in the U.S. From then on QSL cards began rolling in and the walls of his shack showed evidence of the growing number of stations contacted.

In 1924 Roy decided he needed more power to go after those "hard-to-get" stations. This time he built a 250W rig using the UV-204A and when it was finished it put out a wallop of a signal. With the new rig, he began working stations in Hawaii and Australia, with the list growing larger each day. He was now on his way to try for some real DX records and his intention was to work all the United States (WAS) and the continents of the world (WAC).

He was having a ball with ham radio 1930, when girls and sports cars took over. Little by little he lost interest and dust began to collect on the gear. However the sports cars and the girls did not last long, for in 1932 Roy got married and from then on he was too busy running Antoine's.

For the next 28 years there was no thought about amateur radio until one day in 1960 he had an accident and was laid up with a back injury. While convalescing, one of his friends brought over some QSTs so that he could pass the time reading. There must have been bugs between the pages. One of them bit Roy and again ham radio was flowing through his veins. From then on catalogs were scanned and plans made for the new shack. In the meantime, he recovered from the accident and went down to the FCC office and took the examination for his General ticket. After nervously waiting for several weeks, a notice came in the mail marked "PASSED" and Roy now was on cloud nine. The new call letters were W5RU.

Roy was now ready to continue with ham radio from where he left off in 1930. He

purchased a Johnson 500 AM Transmitter and erected a tower with a Telrex 3-element 20 meter beam. Again he began working stations in all parts of the world and having the time of his life. He was now on his way to complete the WAS and WAC records and get certificates.

It was not long before Roy found that the AM rig was getting him into trouble as the "hard-to-get" DX stations were in the single sideband part of the bands. Every time he ventured into this territory every one of the sideband stations told him to get sideband gear or *else*. So it was either "fight 'em or join 'em" and Roy decided to join them. He acquired an SB 101-A Transceiver and a 10A Exciter and from then on he was one of the gang.

Now it was on for more DX contacts which Roy loved so well. It was good hunting and one of his first contacts with sideband was working KL7FLC on a floating ice island near the North Pole. Then later working JT1AG in Mongolia was the start of some great thrills. As time went on there were others like Father Moran, 9N1MN in Kathmandu Nepal, a Russian scientific expedition at the North Pole, and a tiny atoll in the Pacific Ocean named French Frigate Shoals and a U.S. bomber flying over the Congo at 25,000 feet.

Roy swears that he never again will give up amateur radio and recently a Central Electronics 100-V with a Hallicrafters HT-33B linear amplifier was added to his station. The antenna was also changed not too long ago and now is a Telrex six element beam. This has made an improvement in his DX hunting.

During the years from 1960 to date, he has been awarded a number of certificates for his DX accomplishments and feels very proud of them. They are hung in a place of honor in his shack so his guests may see them. He has received the WAS, WAC, WPX awards and has run up his DXCC score to 270.

Although Roy is a very busy man running the House of Antoine's, he took time out in 1968 to take the examination for the Advanced class ticket and passed it with flying colors. Talking about licenses, very few people know that Roy once held a commercial ticket in 1923 but could not find time to go to sea.

Roy L. Alciatore W5RU sitting in operating position with visiting young Japanese ham friend, Naoyuki Kano JA4BVH. Kano is also 2nd radio operator on Japanese bulk carrier M.S. Mushasni Maru, N.Y.K. line.

Roy Alciatore, radio amateur and restaurateur, although host to thousands of famous celebrities, still enjoys being host to the many radio amateurs who visit New Orleans. During Mardi Gras week you might think a hamfest was in town by the number of hams found at Antoine's enjoying the gourmet dishes *par excellence*. Radio amateurs of many nations, while in the United States, have made special trips to New Orleans just to meet Roy.

PROFILE . . . Roy Alciatore, W5RU, would not be complete without some enlightening facts about Roy Alciatore, restaurateur. Since 1930, he has been the proprietor of Antoine's but before taking over the management, he learned his trade well. From 1920 to 1923, he was an apprentice worker in his father's restaurant and from then on continued studies in famous restaurants in France. Thus the gifted training of his father made him well prepared to take over the management of the House of Antoine's.

It would take many more pages to describe all of the unusual features of Antoine's, but for those who have never partaken of the culinary arts at this home of fine cooking, we will use a famous phrase, "Antoine's is to New Orleans what Delmonico's was to New York or Cafe Anglais to Paris."

. . .K6GKX

Sue Miller W9CNW
R.R. 1, Box 95
Waldron IN 46182

IT HAPPENED IN MEXICO!

We (W9NTP and W9CNW) were on our sixth trip into Mexico when it happened. Don and I were driving toward Mazatlan from Ixltan on a Tuesday morning, and as we neared the junction at Santiago, we noticed a commercial bus had pulled off the highway and stopped at the junction while unloading passengers. I was driving about 25 mph past the bus, when a short, heavy-set Mexican darted past the front of the bus and into the front side of our camper truck. The impact bounded him back into the bus and onto the road. There he lay in a pathetic heap. We stopped immediately, blocked traffic, and tried to get help. All the people, and there must have been at least fifty around the bus stop, ignored us and the injured man. The bus had a schedule to meet and dismissed the accident by simply continuing on its way. There was blood under the man's face and on the road. I dampened a handkerchief and cleaned up his face. There seemed to be a surface wound on his forehead and cheek which was much like a floor burn. Some of the people motioned to us to get the truck out of the road because of some big semi-trucks barreling down on us. We and one unidentified man helped get the injured man into the cab of the truck. I got into the camper and Don left the back flap up for ventilation.

The injured man was able to direct Don to the hospital at Santiago – about six miles from the scene of the accident. Santiago is a city of about 20,000, but is completely off the tourist path, so few people speak English. It is down at ocean level, but inland, so very warm. Santiago had cobblestone streets, and the roughness knocked the back flap of the truck down on my arm and hand, and I sat there bleeding more than our injured passenger.

At the hospital an attendant helped get the man on a stretcher and carry him into the hospital via the front steps. The man could stand with no obvious pain, but to take a step hurt his side or ribs in some way. That was why they used the stretcher. No one around could speak English. A policeman was on duty at the hospital, and soon two others came. We drew pictures, acted out the accident, and used sign language to tell how the accident had happened. After

all our explanations one of the policemen got into the truck with us and hand-directed us to park in front of the city police station. Our arrival caused a flurry of conversation, all in Spanish, which neither Don nor I can speak or understand. We were directed inside the jail to an area just outside of a dark cell block filled with men. One jailee in the cell could speak a little English and asked us for identification which he copied down for the policemen. After our identification ceremony, we were motioned to sit behind bars near an unlocked door. For both of us – our first time in jail!

Then a Mexican school teacher showed up with a lawyer of sorts. The "shyster' was a tall, skinny man in a white shirt who flustered like Art Carney would do with every action. The school teacher spoke rather good English. He had gone to live with relatives in Los Angeles when he was ten years old and had gone to both elementary and high school there.

There was a lot of explaining, sketch drawing and saying, "You are not at fault – it will be fixed" but we remained in jail. A brother of the injured man was sent for and stood and looked at us for awhile. There was much more conversation, and the skinny man in the white shirt seemed to be "fixing" it. Another man came, identified as the Mayor of Santiago, and he looked at us for awhile, and then said we could go eat supper in the town's best restaurant. It had an electric fan that one could direct at their table. We had been in jail about four hours.

During our time in jail the other prisoners looked, laughed, sold us some string flowers they had made, and sent boys out for their food. In Mexico one takes care of one's self and needs while in jail. Local teen age boys live right there for the excitement and to wait on the prisoners for pesos. Some wives came and brought food for their husbands. The prisoners in the dark cell were in for stealing and fighting with intent to kill, we gathered, while the ones out in the area we were, were there for drunkenness. There were guards stationed right outside the unlocked door. The door had to be left that way so the boys who waited on the prisoners could go in and out freely, but each time they entered they were checked for liquor.

At about six o'clock the guard was changed. They all lined up with positioning of arms and each time they repositioned they grunted in unison. As we watched, the guards were taking on personalities. We called one John Wayne because he was tall, good looking, and more noticeable than the others. He tried to be friendly and sympathetic. The captain wore a brace around his neck, so he was Stiff Neck. A guard and the teacher went with us to supper. The guard with his gun in holster sat near the door and "guarded." The teacher said the police did not hold us at fault for the accident, but we would have to wait until the district attorney came the next day to release us.

A representative from our Mexican insurance came, and with our help and the help of the interpreter, filled out some papers, and I signed a statement in my own handwriting of how the accident had happened. This report was made after we were escorted by our guard to the best hotel in Santiago. (It had a ceiling fan and two-inch cockroaches.) We had left the truck locked up in front of the police station. They let us put in or remove our belongings whenever we wished but asked us to leave the truck there. The insurance was in order, and we were assured the injured man would have all the necessary care. Earlier someone sent to us in jail for money to purchase a pain shot before he was taken by car to Tepic (about fifty miles away) for X-rays. We were told that he had told the police we were not at fault, but only trying to help him. Someone at the restaurant had told our teacher-interpreter that we had better phone the American Consulate if we wanted to leave before staying three or four days in that sultry, hot city.

On Wednesday our interpreter met us for breakfast. The lawyer showed up and said we owed him $80 for fixing the case and this included $25 for the interpreter, and that we must give him $40 as a retainer. We said his price was too high for nothing. We phoned the American Consulate in Mazatlan and told him we had to get back to the States. He told us we needed a public defender, not the laywer. So Skinny-in-the-white-shirt said we should give him his expenses plus what-

ever we wished to pay him and pay the interpreter ourselves. We told him we were not going to pay anyone anything until we were released to go on our way.

The district attorney, a neatly dressed man about 30, arrived at his offices late. We, the insurance man, and the interpreter, all gathered around his desk, explaining. He pushed us away, saying that he couldn't fill out the necessary papers until the next day, or fine us, until he knew the injured man's condition. Earlier, at breakfast, a Mexican trooper had come and gotten the facts of the accident and assured us were were blameless. He said he would go to Tepic and check on the man at once, and report to the D.A. before he started over from his home in Tepic. At our meeting with the D.A. was our first news that we were to be fined for helping a man! We phoned the American Consulate again. This time he said by Mexican law we were at fault because the man had run into our truck. He also said that the insurance would take care of the man but we could get ourselves straight with the local law. Some help!

We asked the D.A. if we could go to Tepic to see how the man was and stay the night, because it was so hot in Santiago. The only real air-conditioning was in the banks. All other places had fans, and the people who had jobs there tried to get permanent seating in front of a non-rotating fan. The policeman whom we had named John Wayne stayed in the bank most of the time, and did his official guarding from there. The D.A. said we could not take our truck, but we could go with him at 2:00 P.M. when the working day ended. We decided to go to San Blas instead, and go on a jungle cruise, just to have something to do besides waiting for the next day and the fine.

The taxi we took to San Blas was $6.40 for going fifty miles. We got a double-double hotel room. (That means it has a room with twin beds and a room with a double bed, and you can take your choice.) Some people spoke English so everyone we met we were soon telling our tale of woe. An American with a cute, young Mexican wife said they would share the jungle cruise boat expense with us and take us with them to the boat dock. Each American that we talked to said we should not have become involved with helping the man and just left like the bus did. A hippie-looking student from the U.S. and his Mexican wife from Tepic, suggested we get our truck and just leave, since we still had the keys. They offered us their extra license plates for cover, which we declined. The wife said that if we were short of funds we could stay at Tepic with them, or if we were told the next day that we must stay longer,to go to their Tepic address and they would help us all they could, by perhaps getting help through the Tourist Bureau. They did help us phone the D.A. at Tepic to see if he had found out how the injured man was, and if he was working on the papers so we could be fined and on our way the next morning. The D.A. must have had a big night planned because he was not at the phone number he had given us earlier that day. An employee answered and told us that he did not think the D.A. had checked yet on the condition of the man, nor had he been working on the papers.

We planned on leaving San Blas and returning by public bus early the next morning, so we purchased some canned juice and sweet rolls to have in our room for breakfast. During the night there was a terrible thunderstorm. The electricity went off – no fans, no water.

The next morning there was no light nor water for Don to shave. He used a garbage can lid filled with rainwater and stood near the door with a vanity mirror. We couldn't find any glasses for our juice, so we used a deodorant can lid. After breakfast we took the "people's bus" back to Santiago for 12 pesos for both of us. The bus driver was very accommodating to his friends. He carried toilet paper, made deliveries, gave free rides and played a cassette recording that was barely audible over the roar of the bus.

We arrived back in Santiago just at 9:00 A.M. when the D.A. was supposed to be there. The interpreter was there waiting, but the insurance man was not, and he had been there pleading our case the day before. We searched for him around the area of the banks and in the restaurant which had been serving as his and the lawyer's office. They had even been using napkins there as note-paper and the public phone as their own.

Nothing was happening, and we began getting nervous about 9:30 A.M. Don started the truck to see if it was still all there and would run. It did, so he moved it forward to see what reaction this would have on the police who were guarding at the jail. There was no reaction at all! I went in the bank and got a 500 peso note changed to five 100's in anticipation that I might soon be paying the interpreter. "John Wayne" was in the bank guarding, and greeted me with a handshake. The captain was in his office with the door open, and we exchanged "Buenos Dias." Then we three stood and waited until 10:00 A.M. for the D.A. to arrive.

The interpreter said sometimes he doesn't come on Thursdays if he doesn't have a case and that his office girl had not yet arrived. What should we do? Wait another day to be fined? Don started the truck again and drove around the central plaza, moving it out of sight of the police station. Our decision was fast – we would just leave and hope they wouldn't stop us! After all, we were clear with the police, it was just the D.A. and his papers that were holding us up.

The interpreter walked with me across the plaza and Don drove two blocks away and turned. We got in and headed out of town. Don and I paid the interpreter 300 pesos and let him out to walk back and explain our disappearance. He said that he was going to tell the police that we had gone to Tepic to locate the D.A. since he hadn't come to his office that day. The day before, we had given the lawyer money for his expenses of locating people and making some phone calls, but nothing for himself because we were not free to go on our way. He got all excited on Thursday but wouldn't come face us directly, instead he sent word to us that we must think he was a relative or something for the pay we had given him.

Needless to say, we headed the opposite direction from Tepic. After much studying of our maps and trying to out-think anyone who might be after us, we decided to go through a border where many people might be going through and take a mountain road through much of Mexico. We were about 1,000 miles south of the border. We were hoping that if the D.A. really didn't come to work on Thursday we would have until Friday morning to get across before our names were on a "stop" list.

We drove from 10:00 A.M. until 7:00 A.M. the next morning, stopping only for gas, food and coffee to take with us to keep us alert through the night. The scenery through the mountains was beautiful. I wish we could have enjoyed it. The road we chose away from Santiago must have had ten bridges being repaired, and each one had a 15-minute stop for one-way traffic. We even saw one state trooper who paid no attention to us. Nerves – nerves.

About twelve miles south of Laredo we were stopped and asked to sign and give over our visitor's permits. Never can we remember signing the permits before. After giving them up we were motioned on – only twelve miles to go, but we must get through customs near the bridge and twelve miles was time enough to telephone ahead if we were on the "stop" list and thereby get us stopped. We tried to get in a busy line for Mexican customs, but even so the customs man went around to the back – to check the license plate, perhaps? He only peered in the camper for smuggled wet-backs. Don was really only smuggling me and the truck. If we were stopped, I was to jump out, run for the bridge and Texas, for help. The Mexican customs man waved us on over the bridge. I was so nervous that I couldn't find the bridge toll and held up the line for several seconds. Even American customs made us nervous, but there must be no communication between the two customs. We were treated very nicely and soon were motioned forward. Sure did enjoy a hearty breakfast that morning!

As we were leaving Laredo there was a road block. There was communications over the bridge after all, and we shouldn't have stopped for that breakfast. No, we were waved on, so it wasn't a camper truck and two American hams they were looking for.

Even after we arived home I'm fearful of all registered mail. I'm almost afraid to record this for others to read.

It's great to be on United States soil again and home in Indiana. We won't be returning to Mexico – until next summer.

. . .W9CNW

Letters - Cont'd From p.11

RBL-4

I have recently acquired an RBL-4 Very Low Frequency Receiver. The unit is navy surplus and covers from 15 to 600 kHz in 6 bands. It has a regenerative detector but is surprisingly sensitive, stable and selective. I am using a 120 foot dipole for an antenna and it seems to work quite well.

Early this morning I was tuning around and decided to log everything that I heard. The results are not too surprising. But, nonetheless I heard much, much more than I had expected. The log goes as follows:

kHz		
12.5	Tones	
18.4	RTTY	
36.0	RTTY	
75	RTTY	
88.1	CW	NAM
90–110	Loran C	
123	RTTY	
140	FAX	
184	RTTY	
194	Beacon	TUK
204	Beacon	SOG
218	Beacon	EPP
225	Beacon	BUT
235	Beacon	CNH
250	Beacon	DRC
262	Beacon	AMH
270	Beacon	TOF
282	Beacon	REI
440	CW	CFH

If anyone knows the location of the above aircraft beacons and miscellaneous stations, could they please write to me at the following address: Michael Kane WA1PJG, 50 South Porter Street, Manchester NH 03103.

Anybody interested in forming a club of VLF listeners should write me at the above address also. As an addition there is also a new band in the VLF spectrum that can be used as a license free 'Ham band" (160 to 190 kHz). Power input is limited to one watt and antenna length is limited to 50 feet. OKay all you QRP men, here's your chance.

Michael Kane WA1PJG

Hey, enjoyed that cover of May. Had bugged you for a year or more for a pin up for "us" women.

XYL WB4ELE
Joseph L. Mimms, Jr.

I just completed the 'Cheap 10 Minute Timer" on page 47 of the July issue of 73 Magazine. Really great project, works beautifully. I thought that I would put it on a pc board, but found that according to Murphy's Law the etch bottle was devoid of fluid. Nearest supply was Richmond IN – 30 miles one way, and with gas at 58¢ for regular, ugh, must be a better way – there was. Took out the trusty hack saw and sawed 5 slots just through the copper of the board to fit the 555 pins, sawed one slot length ways of the board, and another across the board and presto instant PC board with isolated pads. If the constructor is ambitious he can drill and mount from the insulated side – if lazy like me he can simply solder to the foil side using a small cone tip to install the 555 – be sure the board is pre-tinned and solder quickly. The slots for the IC should be about as wide as the pins on the top side of the IC. A few jumpers and you are in business. Incidently a 32 tooth blade works much better than an 18 tooth blade in this type of work (hacksaw blade that is).

Charles T. Larson W9JWH
Connersville IN 47331

DYCOMM AGAIN

I read with great interest the letter in July on the Dycomm Super "D." I too have experienced the same trouble with my kit and now have retired it after eight days of service. Both of the transistors in my unit went out.

I was driving my Dycomm with the Drake TR-22 and while it worked was getting about 20 watts output.

Fred Brockway WB4SLW

LICENSE SYSTEM

Concerning the recent flurry of activity about changing the structure of the licensing system. I feel that the present system is fair and does exactly what it's intended to do, namely, to keep our ranks down to those who are truly interested in radio, as a hobby and a progressive, modern, communications service. So what if the current trend in our growth is down 3% or so.

I'm a newcomer to amateur radio, belong to no clubs or organizations, but try to keep abreast of current feelings toward our hobby by the younger segment of the population. Being 19 years old and getting my first license as a result of a high school class, I think I'm in a good position to take the soap-box. After watching 3 years of students go through the mill for their Novice license, practicing code copy 20 minutes a day for 3 weeks, and seeing not one fail, I'm convinced that difficult entrance is not that big of a problem.

I would like to point out that perhpas the problem isn't in the licensing system, but in the availability of willing examiners for the Novice-to-be.

Ready to take my code test, I went in search of the nearest 80 foot antenna tower and upon pounding on the unknown door. . .

"Um. . .Sir. . .will you give me my Novice code test?" Blank expression.

"Oh, you're a CB operator?!"

"Well, sorry, wrong house."

10 thumbs Cook promptly goes home and listens to his SW receiver for another 12 months. Before hitting the CBer, I'd tried two or three hams in the area, each giving me an excuse to rid themselves of me.

I'm looking forward to enjoying this hobby for many years, but it worries me that more people are harping large numbers instead of good organization and responsible, educated operators. To those that are doing this, I would ask that they view very closely how little control can be exercised over the CBer, (even by their own ranks). I believe I will sell my gear if a liberal banded, code free license with a Novice exam is implemented. 4 WPM and 13 WPM code copy jus' taint that hard!

Brian J. Cook WBØEPP

I have just read the article "Restructuring Amateur Radio" in the July issue of 73 Magazine and feel I should send you my two cents worth for what ever it is worth.

Some years ago I belonged to ARRL but when they advocated taking segments of the various bands away from the General Licensed Amateur and made it necessary for the General to take more advanced tests to upgrade their license in order to recover the privileges we once had I objected to ARRL by letter and on the air. I further predicted if their proposal ever went through many prospective hams would stop trying and manufacturers of ham equipment would stop making this equipment. I guess I need not tell you their proposal finally went through and I know of three major manufacturers went out of the ham business and turned to CB. I see two of them are now trying to come back. The ARRL tried to make us believe this was incentive licensing. I may be getting old and queer, but no one can convince me that taking something away from someone and then tell them to take more tests to get it back is incentive anything. As soon as this happened I dropped out of ARRL, never to rejoin.

As far as our license structure is concerned I feel it is hinged around CW too much. Yes there are those who only want to work CW and there are those who only want to work phone; I am one of the latter. I am a retired person and CW comes very hard to me, so I guess I must stay where I am.

As far as frequencies are concerned I feel they (FCC) should be more liberal. I have listened to some good DX, but out of my frequency I could not try to work them. Why can't we have some of the phone privileges the other countries have? I have no objec-

tions in taking further tests on FCC rules or technical questions even though I must travel sixty miles one way to take more tests.

I have been a subscriber to 73 Magazine for several years and think it is one of the best. I am all for you in your problems with the IRS and hope you win out in the end. I, too, have been one of their victims due to a mathematical error in my return.

K3KBG

VTR INFO

A recent article in 73 indicated all that was necessary to record good video from a TV receiver was to tack a wire on the video detector diode and plug it into the VTR. Unfortunately, though your low cap. scope probe might provide 1 V of clean video, try sticking a 75 ohm resistor across the scope input.

Results: No video, no audio.

Here's a quick and dirty method I've used several times. FET input (HI Z) emitter follower out (LO Z) negative sync. Just what the doctor ordered. The VTR we have been driving has a 75 ohm AC and DC load at the video input (BELL & HOWELL MODEL 2966). If you don't like DC into your VTR you can use an emitter load resistor and a BIG capacitor with good results. To recover good audio you must get the 4.5 MHz sound carrier past the point of video detection so I've included the switching system we use. For the short coax runs within the TV receiver I use RG 174 because of its size and low cap. Then RG 59 U to and from the VTR. The positions of the 4P3T SWITCH are #1 straight through (NO VTR TAPS) #2 VIDEO & AUDIO RECORD #3 VIDEO & AUDIO PLAY BACK. Adding a VTR to your ATV System is not difficult.

I was happy to see a new series of ATV articles by Terry Fox under ATV RASTER. I hope he will also include some special effects ckts, I C Video amps (MC 1350?), state of the art camera, etc.

Richard Wright
Engineering Vice President

QSL CARD WINNER

I just wanted to express my surprise and delight to see my QSL card in the July issue that arrived this morning. I am also glad the card was printed right side up, otherwise who knows what TLS 7K is? The card is a plug for keeping CW alive and healthy on the ham bands!

I have been having fun with that 21 WPM tape of mixed characters. I am hoping to press on to higher ground like an extra class license exam next month. And being in my business you are supposed to press onward to higher ground!

(Rev) Bill Ehlers K7SLT

MORE COMPUTERS

I would like to see more computer articles as follow up to the article in the (I believe) October 72 issue. I realize that these would only be of interest to a few of your readers, at least at first, but the uses to which they could be put and the proliferation of low-cost components seems to me to make this a field for amateurs to explore. Perhaps a monthly or bi-monthly column like SSTV Scene, etc., could get things started.

Regarding your editorials about the IRS or Walker or whatever may come up in the future — don't back down. The only way things will ever get better is for enough people to make enough noise until the body in power can ignore it no longer. Governing organizations always become as bad as the governed will stand. They either forget or ignore the fact that they derive their existence from the governed and not the other way around. Anyway, keep it up — you can't put out a fire unless you know there is one.

Don't let the prudes dictate what you run on your covers. You don't need bare skin to make a good picture (April 74 for example — exquisite!), but it seldom hurts. If the picture is appropriate use it.

Larry Dingle
Garden Grove CA 92640

RESTRUCTURING ?

I just received a check from you for my story entitled "Short Ship." I can't thank you enough or tell you what it means to me.

Not to tell you my life story or anything like that, but I'm 27 and have been handicapped all my life. I have never worked or lived at home with my parents.

Needless to say your check for my article was the first money I have ever earned. It sure was a wonderful feeling and again I want to thank you for the great privilege. I hope with your permission to send in more humor articles in the future for your consideration.

It is more convenient for me to write or print than to type. I hope this is okay. Keep up the great work in 73.

Steven Rich WA1DFL
31 Arlington Avenue
Revere MA 02151

ANON LETTER

Who the (unintelligible expletive) hell do you think you are, impugning the IRS? That's a fine little collection agency, Buster. For example: I'm just a plain peon who never made enough in one year to fill a (unintelligible) San Clemente (unintelligible) pot, but the little guy means just as much to the IRS as you Eastern big shots and by golly they took time out to give me two complete audits. I couldn't ask for more attention! And when they found out my returns were straight arrow they gave me back my records.

They didn't even charge me anything for all the time it took. I was amazed that they would bother with me because I've never had any investments or stuff like that — just a lousy paycheck and a lot of medical expenses. Made pretty dull reading for those people, but they didn't complain. No sir.

One time, years before the audits, they sent a message to me where I was holed up in a little village on the Bering Sea telling me that a U.S. Marshall would be confiscating all my property (!), and I was not to sell anything or wipe my (unintelligible), etc., until further notice. I knew this was just a mixup so I sent them a wire advising them to (unintelligible) off. They did. I had claimed as a total and uninsured loss an airplane I had personally flown into hard ground at 60 degrees below zero near Gulkana, Alaska. We wrote back and forth about this, but as I said they just seemed to get more mixed up until I had to tell them to (unintelligible) off. I've never cheated them, and they haven't cheated me. I just wished they wouldn't waste their time on me. One time I talked things over with one of the ladies in their Seattle office and she was so nice I felt sad and disoriented. Just don't use my name.

Anon.

EQUIPMENT

Mr. Butterfield has passed away — so please do not send any more magazines.

If by any chance you know of anyone in my area that would be interested in some equipment, please advise. Thank you.

Mrs. Howard Butterfield
Union NJ 07083

THANKS

Thank you, Wayne, for the outstanding job you're doing for the amateurs of America — you really make an impression — I can't talk to an amateur anywhere who isn't either 100% for or against you. It shows that you and your magazine are making an impact. Keep up the good work.

Robert N. Ernst WB2GYO/3
Washington DC 20336

CB

How about all you Hams that are truck drivers putting a rig in your truck? I've had an FM radio in my truck for 2 years and have worked repeaters all over the country. I've made a lot of eyeballs and friends that I couldn't have done just operating in the shack. I fill a log book up almost every run. How about it? Get away from the C.B. crowd and join your buddies on the Ham bands.

Bill Zellers WB6WYU
Anshiem CA 92801

good idea! - w.g.

NEW BREED?

The April edition had an article, "The New Breed on 2 Meter FM," by K2PPM concerning the practice of buying and selling exams; in the article, these were sought by ex-CBers.

It points out one basic truth: What a person earns he respects; what he obtains otherwise is of low esteem. Just listen to the garbage on many repeaters carried over from eleven meters! The whole situation is one helluva good argument for much tougher incentive licensing. And now that the FCC is looking into the true qualifications of Techs they are relearning what so many old timers have said right along: *Reduced license qualifications always results in reduced operator quality*.

Technician licenses should be issued based only on an exam administered by the FCC; they should not be renewable. Also, General class should be renewable only once; thereafter, up or out! And let's get 2-meters back into the incentive plan along with 220 and 450.

Al Chapman W6MEO
Alhambra CA 91801

Harsh words, Al. Is it possible that 2m FM is different in So Cal from the rest of the country? Perhaps it is the difference that has resulted in bad 2m operating, not the Tech license itself? Suppose your conclusions are biased by the peculiar situations you have in So Cal? Is it worth more wide study?. . .wayne.

DU DIRTY WORK

As an Amateur in the U.S. Navy it is frequently impossible to operate while stationed in foreign countries. Even though reciprical licensing is on the increase it still is not a reality in the Republic of the Philippines. It appears that only certain privileged individuals are allowed to operate in the Philippines.

I and many other hams have been trying to get the U.S. Embassy to push for a reciprocal agreement with the Philippine Government. We have written Senator Goldwater, who was unable to get anything accomplished.

Now we have discovered that the main reason nothing is being done is that a certain individual in the U.S. Embassy Staff in Manila is stopping and discouraging any formal action of concluding a reciprocal agreement between the U.S. and R P. Governments. The real "Kicker" in this is that same individual has these privileges and is licensed to operate here in the Philippines. It appears that he wants to belong to an elite group of one. It is unfair that someone in the Embassy should be able to operate while an American Service Man cannot. I think it stinks and smacks of political influence. It appears that someone should be able to do something about it. What's good for one American Amateur is good for another.

Another note on the same subject is that the Philippine Amateur Radio Association is a strong proponent of reciprocal privileges and have supported our plight to their government.

Harry E. Tasker W5OIQ

I have never subscribed to your magazine. I have, though, read some of your articles in friends magazines and thought that you were rather biased in your views on the ARRL. A recent experience has changed by opinion.

To make a long story short, a group of servicemen stationed here in the Republic of the Philippines have been trying for a long time to secure a reciprocal amateur radio operating agreement between the United States and the Philippines. You recently received a letter from W5OIQ, Harry E. Tasker, containing copys of all our efforts to date. A similar package was sent to the ARRL by me.

While I didn't expect an onslaught of assistance, I really didn't expect total apathy either.

You can expect a future subscriber.

Robert W. Johnston WB4SNN

RESTRUCTIONING

Just read with great interest your commentary on a restructure of the licensing scheme.

Two things you do not mention that I have heard bouncing about are a so-called "Japanese Plan," based on a no-code beginners license in Japan that is deemed very successful, and a dual-ladder structure wherein there would be an HF-licensed progression, and a VHF-licensed progression.

My own feeling as a inveterate "commentator-on-Dockets," is that perhaps a beginners no-code VHF Novice license be created with privileges only on 220 – but no repeater privileges.

I was going to write a proposal to FCC and formally submit it, but feel they're glutted now and it's better to wait for a Request for Proposed Rulemaking since much of FCC own solutions might be OK (did I say that? Must have forgotten 18803!).

Anyway, thought you might be able to shed some light on that Japanese Plan and the dual ladder licensing structure.

Oh – why 220? To get it used! EIA wanted to sell "radios" up there, so maybe they still can.

William John Good, Jr. K1HZN
E. Derry NH 03041

GOOD STUDY GUIDES

Help, help, help. Please rush General Class Study Guide immediately. Have used ARRL and found it to be of no use on current test I took last evening. Know your study guide of over 200 pages will do more good than one of 20!!!

Love your magazine. Give the IRS "HELL."

Ann Williams WN4EQC
Richmond VA 23233

TRULY GREAT HAM

I very much enjoyed "The Truly Great Ham" in March "73." The author has me and a lot of other hams right behind the old 8 ball. I can't wait to see the reaction to her next story (The Conventional XYL) when it is published. It is interesting that Laura takes such liberty at shooting down stray hams. Now for the awful truth. *Laura Sargent is herself – a ham.* No longer can she say all those things about how weird hams are with a straight face. She has had her tongue in her cheek for so long that in another few months her face will become deformed, unless of course, she moves her tongue from one cheek to the other. (Turning the other cheek?) I can say all this and not get sued for liable because I know her quite well. For 3 years she nursed me through C.B. and was there when I finally snapped out of shock and got my ham ticket. For this I say thank you. Her call is WA7YUA.

Bill Sargent WA7UJH
Phoenix AZ 85022

THANKS TO 73

Enclosed is a check for $3.95 for a copy of your 13 WPM Practice Tape. Your *Amateur Radio General Class License Study Guide* is very well done. Nine bills to take or upgrade is one thing, but to wash out a couple of code tests at nine dollars a shot is to be avoided if possible.

Keep up the good work, you people have a fine magazine. QST said in April's, "It Seems to Us. . ." that of their sampling of amateurs from the *Callbook*, "More than twice as many read QST regularly (66%) as read. . ." any of the rest and 57% rated it as their favorite. I suspect you have seen the article, and it looks like they have found out why amateur radio is in such a mess, though I am sure they don't see it that way. Five years ago I was WN4GJL (God Jollys Loose), and a devoted League member. I found the projects very technical and costly, requiring "easy" to get things like gold plated P-C boards, etc. At the end of the year I didn't even try for a higher grade license. That may not be the League's fault 100%, but they did not help. 73 has got me interested again, and for that, I thank you all.

Edwin J. Jolly
8359 Alvord Street
McLean VA 22101

DEAR 73

We are planning on starting a beginners class this summer and after hearing one of your tapes are convinced this is what we need.

Robert H. Rhoades K7ERB
Scottsdale AZ 85256

Letters cont'd

RE K2PMM

I really enjoyed the article by "Wretched" Coward in the April issue of 73. Always did wonder what happened to him. Perhaps this might be 73's answer to that chap who use to write that column with the "Feenix" byline.

One question: Is it true that 'PMM never made it past the Technician class?

Keep up the good work, Wayne.

W1AIM/1

(Doubt it. . .wayne).

6m REPEATER

What do you think the possibilities are for getting modifications to the Repeater rules? I operate a 6m repeater on top of a local mountain and this mountain is approximately 1500 feet high, so we must use a transmitter ERP of 25 watts which in this hilly country is crazy. The FM broadcast station here runs 36 kW ERP and we have problems getting around the many hills in the Seattle area and 25 watts of power on our repeater really gets lost in parts of town. I guess what I am saying is what may be a good rule when applied to flat country won't work in our mountainous country here on the West Coast.

Ernie Opel W7YTE
Seattle WA

LIKES US

I have been an active amateur for many years, and really appreciate the many fine articles presented in 73. . .please keep up the good work.

I expect to see many more fine articles, especially with respect to IRS tactics, from W2NSD. . .keep up the excellent work, Wayne. . .there are many of us who admire your courage in opening up such a "can of worms."

R. R. Davis WA4DJG
Pompano Beach FL 33062

Without "73's" help our repeater (WR2ABX) would not have been licensed as easily as it was. We here at the Kavaler household (OM, Ed, WA2ZMI, JR-0#1, Ira, WA2ZIR, and JR-0#2, Frank, WBZCFJ) all thank you.

Ira F. Kavaler
Brooklyn NY 11226

(you're welcome — wayne).

I got my start in Ham Radio two years ago. I have seen and read about all the "ham books" published. "Ham" is too far over my head. "C.Q." is a dirty low down underhanded publication. They told me when I got my Novice ticket, they would send me 6 months free subscriptions. After two free copies they gave me the old song, "price of publication has gone up, we can no longer afford to send you. . .etc." To hell with C.Q. Q.S.T. is okay — I like it alright (sorry Wayne). But I really enjoy "73." It's the very best ham magazine publication put out. I really enjoy it.

Dick Jones
Granite Quarry NC 28072

THANKS CLEGG

Through the medium of "73," I would like to thank Ed Ivey of the Clegg Company for the trouble he went to over my 27B.

I called Ed because a dealer who doesn't advertise in "73" didn't send my set in for a check-up as promised.

The dealer had moved premises and still had my set with him. He didn't let me know he had moved. If it hadn't been for Ed Ivey, I could have been permanently Q.R.T.'d on 2 meters.

Thanks to Ed who chased him down and got some action. That's one dealer in Cincinnati who won't get another dime out of me.

Most manufacturers don't go to that trouble — Clegg and Ed Ivey DID.

David J. Jarman
Aurora, Indiana 47001

COMMUNICATIONS

I read with interest your recent editorial in the January, 1974 issue particularly the sections pertaining to automated mail handling and other telecommunications substitutes for paper shuffling, book bookkeeping, etc.

As an active ham (WA8VBN/6) and a communications scientist, I can say that much of which you speculate about is already either in prototype form, or available on the market.

For instance, there are a considerable number of large information processing type companies (or their divisions), ITT, Xerox, GE Information Systems, etc., that have developed information retrieval services. In fact, beginning in 1975, one major publisher, Chemical Abstracts will only be supplying their publications in computer tape format. Of course, there are literally dozens of companies that offer automated, computerized retrieval services (e.g., ISI, Philadelphia, PA.) whether in hardware form or in software form abstracting articles and concepts the user identifies.

However, you dealt with two other issues I would like to briefly describe. One, automatic, electronic message handling. Two, home terminal use and potential software.

In the first there are a number of networks (e.g., ARPA) that already, within professional circles, handle messages and communications electronically. At the network nodes, you will find completely paperless offices, with secretaries inputing all information via CRT. Whenever hardcopy is needed, they simply activate a hardcopy or facsimile machine. Further, these networks allow persons on the net to communicate with each other via message switching computers which store and forward electronic mail destined, and accessible only to the targeted individual. A related development, is the emergence over the last three years of specialized common carriers who provide computer networks; analog lines of bit capacities in the hundreds of MHz, and digital lines, all across the country. These companies are emerging as a result of FCC decisions restricting the monopolistic position of Ma Bell in the same way that the 1968 Carterfone decision opened up Ma Bell lines to non-Western Electric equipment (of course hams for years had been attaching to those lines without much squable. Likewise, a new class of networks, called VANS, Value Added Networks, take Bell's lines and via state of the art technology offer analog and digital transmission channels and efficiencies that for high volume prices beat AT & T's prices. Considering the impact of private equipment manufacturer's office phone systems, home cable TV attachments, you can predict what will happen in a few years.

In addition, *there is* a large emphasis now on automated offices, which perform exactly what you describe, replacing phone, typewriter and paper. Paper handling is as obsolete for communication as physical proximity is for communication. Hams, of course, have always known this, with repeaters, phone patching, etc. Now the business community is in fact getting into the act.

In fact, I'm working on a large National Science Foundation grant investigating telecommunication substitutes for transportation. This investigates the technology, acceptability, tradeoff factors involved in substituting the morning commute for interaction via home two way terminals. As you no doubt can guess, this raises a number of issues.

Moving on to home terminals use, let me tell you that all that stands in the way of widespread networking via home terminals, including EFTS (electronic funds transfer), home medical diagnosis, education, library searches, catalog shopping, etc., is the penetration of cable TV. Cable TV has a current penetration of about 10% nationally; although up to about 40% in selected metropolitan areas. As long as national penetration is below 50%, RAND studies, et al, estimate little incentive for the public and the manufacturers to generate interest in cable as anything other than "better TV and FM reception. . ." the latter being an extremely lame interpretation of its potential.

There are already some pilot two-way cable systems in the country providing prototype services. What these systems are testing is the psychological and economic feasibility of such services.

Incidentally, there are few electronic problems left to be solved,

Letters cont'd from p.135

although many of these are of the chicken and egg variety – not enough demand keeps R & D money out, or keeps prices too high for popular adoption, and vice versa. One of the problems still being investigated is the one of channel bandwidth, especially as it relates to video. I astound my friends when I describe Hamdom's activities with slowscan, and the consequent bandwidth compression. Only now are some of the larger corporations touting that they can manufacture home videosystems that change frames every 12 seconds!!

Incidentally, the Post Office is investigating various forms of electronic message handling, including all types of automated mail handling.

Well, the purpose of this letter is not to merely describe these to you, but to advise you that I'd be interested, if you're interested, in writing an article or two on such developments, and related ones, primarily dealing with issues I've discussed, but also how these applications utilize some of hamdom's techniques. Not only would such articles bring the ham fraternity up to date on "what's happening" in the outside world of communication applications, but perhaps might spark the interest of technology/software type entrepreneurs that read 73.

I look forward to hearing from you.

Gerhard J. Hanneman, Ph.D.
Information Sciences Director

W2NSD/I cont'd from p.3

decide to canvas the neighborhood for books for the local hospital – for a mental institution – for games for day care centers – toys for poor kids for Christmas – organize an auction – etc. Just think constructively, if possible.

MORSE CODE SPECIFICATIONS

During the making of the 73 Morse Code study tapes there was a question of what actually constituted 13-per. Thirteen five letter code groups, obviously – but how long should each letter be? A five "e" group goes by awfully quickly, while a five "y" group hangs in there for a long time.

It turned out that the FCC has surmounted this problem by setting up the standard for word length – they use the word 'paris' for reference. Using this, we set up the 73 study tapes to match the FCC standard of speed. We wanted to make sure that users of the 73 cassettes would have a little extra margin for error (and panic), so we upped each speed by one word per minute. The FCC exams are in plain language, and that makes them even easier.

Users of the 73 cassettes have been writing to tell us that once they mastered the tapes they had no problem whatever with the code exam. Since more people flunk the code exam than the theory, this is a big plus. It's nice to protect that $9 exam fee – not to mention the embarassment of failing and the wasted time.

Techs being recalled for monitored exams will appreciate the six word per minute cassette. It is sent at the official FCC rate of 13-per for each individual character – a little item which comes as a terrible shock to many Techs when they come in to face The Man.

We've checked every code course on the market we could find and not one of them seems to be made up using the FCC standards. Perhaps we're the only one to check.

By the way – many readers have been getting the 21-per tape and telling us that they are surprised at how easy it is to learn to copy this. They all expected it to be almost impossible, yet in a few days they are getting just about every character. There is nothing difficult about learning the code except getting down to practice.

TECH EDITOR JOB OPEN

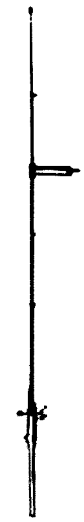
If you are a reasonably good writer and know your technical onions you might be interested in working for 73 Magazine up in the beautiful mountains of New Hampshire. If you're a died-in-the wool ham, there is nothing more satisfying than working for a ham magazine. The job includes, among other things, preparing articles for publication, preparing the newspages, checking schematics etc. The pay is good and the people most congenial. Send a resume or letter to 73 Magazine, Peterborough NH 03458.

SSTV TAPE AVAILABLE

Though no reason suggests itself as to why anyone would want to spend S3.95 to get a 60-minute cassette of the twelve best entries in the 73 Magazine Slow Scan Contest, copies of said tape are available. The cassette does make an excellent demo of slow scan for hamfests, club meetings and such. It might even be helpful for store demonstrations of slow scan. Well, whatever your bag, the cassette is available for S3.95 postpaid from 73 Magazine, Peterborough NH 03458.

LAST MINUTE FCC RELEASES *See p.139*

New Products cont'd fom p.11



CUSHCRAFT RINGO RANGER

Cushcraft has announced a series of Ringo antennas which have three half waves in phase by virtue of an eighth wave phasing stub. There are models for the 146, 220 and 450 MHz bands. This new antenna has both added gain over a regular Ringo antenna plus greater concentration of the signal on the horizon, where you normally desire it. Ringo owners may prefer to get a conversion kit to extend their present antennas. These, too, are available from Cushcraft distributors. Cushcraft clams to sell more ham antennas than all other antenna manufacturers combined – and this seems like a reasonable claim.

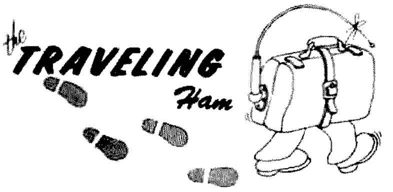
CUBEX QUAD

The Cubex Company of Altadena, California makes one heckuva line of quads. The hardware is definitely not shoddy, it is heavy, heavy duty designed to take all old mother nature can dish out and still be zapping out that big signal.

Latest addition to the family is the 4 element Zone Master. The spreaders are heavy guage aluminum-machined so that a chisel must be inserted in the key way to obtain clearance for fitting to the boom. After removing the chisel a press fit is the result. The bolt is then tightened and the spreader is locked for life. The arms are of sky blue fibreglass-strong, light-weight and pleasing to the eye. The elements are of copper, heavy tin plated. The 3" boom is about as indestructible as a boom can be.

Specs are conservatively stated as: 12-14 dB gain, power handling in excess of amateur limits. Boom length 30' – OD 3". Turn radius 17' wind load 7.2 square feet, weight 72 lbs. Front to back ration 24 dB minimum.

Brochure from *Cubex Company, P.O. Box 131, Altadena, California 91001.*



Joe Kasser G3ZCZ
1701 East West Highway, Apt. 205
Silver Spring MD 20910

The traveling ham covers a wide field. It covers the whole FM field from a user point of view, telling outsiders what sort of activity there is in your area. It covers the mobile field and the portable antenna set ups. It also can touch on the qrp field because those rigs can be made very small and are thus suitable for the traveling ham. It also covers reciprocal operating, how to get a permit and use it. It also can focus on amateur radio activity in other countries and show how it differs from in the USA. What it actually covers is up to you, the reader. If you want to read about repeaters in the USA or about operating activity in other countries or putting a rig in your car or operating out of a motel window, you have to invest a small amount of time and a 10¢ postage stamp and let me know. I usually answer personally to most letters as well as use the information in the column.

Talking about two meter repeaters, what sort of wild id's does yours have? Do you know about the one in Delaware that has a sexy female voice identification, or the one in Atlanta that identifies by voice (female) and gives the time, or the one in Virginia that puts an HI in morse before the morse identification, or the one in the Washington DC area that signs DE WR3ABU AMSAT RPT in morse code. It must surely have the longest id in the world.

You will probably have noticed the change of qth on my byline. I am writing this just in time to make the deadline (I hope) surrounded by boxes and the rest of the debris of moving and packing. The ham gear is all packed as is the antenna but the rig is still on the bench and I think that I could be on the air again within minutes xyl permitting. Still it's only when you move that you realize how much stuff has accumulated.

Another facet for the traveling ham to consider is to work through OSCAR. It can be done using a two meter FM rig in the CW mode for the transmitter and a sensitive ten meter receiver for the downlink. All you need to join in the fun is a crystal to put you in the OSCAR uplink (145.9 to 146.0 MHz) and about 100 watts erp, that is 50W to a 5/8 mobile whip on the trunk. The receiving antenna can be a Hustler ten meter whip. Just park out in the open in time for a pass and join in the fun.

It's a shame that commercial SSB transmitters or transverters are no longer being sold in the USA, because these are ideal for OSCAR work. Over in Europe FM/SSB rigs are available for two meters with synthesized frequency control, as are transverters and AM/CW rigs. It seems that FM has taken over in the USA on VHF at least and has driven all other modes out. One transverter in England comes with cables so that it may plug straight into the Yaesu FT101. Now that AMSAT has another active control station for the European area OSCAR activity should increase enormously so for the traveling VHF ham a new world of DX has opened up and should be used.

Talking of using VHF, many amateurs in the USA are talking about the expansion of the amateur HF bands and even the allocation of new bands at the next frequency allocations conference, well stop for a minute and note that Singapore lost the use of its two meter band. France has lost some of its 23cm band including 1296-1298 MHz and is sharing its two meter band with the military. This is not similar to the attack on 220 here because two meters is an internationally allocated exclusive amateur band. We amateurs now have to claim our VHF/UHF bands because once again history is repeating itself. First we were given the HF bands, and when their usefulness was proven, they were taken from us leaving us just a few hundred kilocycles instead of the wide open spaces that we had before. Now that space communications have shown the dx reliability of VHF we are about to loose our VHF/UHF bands unless we can show that we use them, so you traveling hams come on and do your bit and work OSCAR. While you are out there waiting for that next orbit put pen to paper and let me know about the activity in your area.

G3ZCZ

Here, reprinted from the fine club bulletin of the K1FFK repeater group, "The Squelch Tale," is what happened to one of their errant members who decided to kachunk the repeater on a regular basis.

de WA1PVV

Well people how does K1FFK sound at 6:00 AM now days? No more urpppppps to worry us. I am probably beating an old horse, but for the people who were not aware of what was going on, I'll tell it one last time.

On Monday, April 22, 1974, WA2CSQ asked me if I would like to join him and Peg (WB2RZZ) on a fox hunt, in hopes of tracking down the Burper. Needless to say I was more than willing to go on this hunt.

Friday, April 26, 1974, time 4:00 AM WA2CSQ and WB2RZZ and myself left my house headed for Schenectady with toothpicks in our eyes and 3 radios and a field strength meter. We arrived at our destination about 5:10 AM, parked the car down the street from our suspects home and waited. We did not know if he was doing his burping mobile or from his home. At 5:45 AM he left his home with us in hot persuit. We followed him to a school where he dropped off a passenger and we had to drive by him hoping he would not see us. We waited down the road for 2 or 3 minutes and he did not go by us, so we guessed that he had backtracked, we took off again, this time just guessing as to which way he had gone. On Interstate Highway 890 at speeds of 80+ mph (closer to 100 mph) we spotted our suspect. Coming upon his rear bumper just as he started to play some music. Both of our radios which were listening on 146.31 came alive with S meter readings, pinning and 2 seconds later K1FFK keyed on repeating the music. The H.T. which was listening on 146.91 DESENSED and our field strength meter pinned. Our suspect or should I say our Burper (now we were positive as to who it was) spotted us and stopped transmitting. Dick WA2CSQ transmitting on 146.91 told him to "Give it up. . ." At this point he knew that he had been caught with his mike down. We followed him to his place of employment where in the parking lot we confronted him and he admitted he was wrong and we got the whole QSO on tape.

I would like to thank Dick for his efforts, the use of his car, radios, tape recorder and driving skills without which we would still be listening to urpppppps at 6:00 AM every morning. Also a big thank you to Peg for going along with us.

EPILOG: The Burper who is known by many people and well liked by many, has been a ham for many years (like 30) is an official O.O. for the ARRL and had important positions with RACES and other organizations. The one thing that we learned from this is, hams *can* police other hams. So effective was our capture that the Burper has sold or is in the process of selling his 2 meter gear. I hope his capture helped him and maybe someday he will get back on 2 meters and rejoin his *Friends* who were only trying to keep things as they should be.

de WA2PVV

Caveat Emptor?

Price – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

WANTED: Hallicrafters Model T-54 7" television in metal cabinet, made 1948-1949 need not be working, but complete. Wayne LeTourneau WBØCTE, 2338 E. South Ave, No. St. Paul MN 55109.

TECH MANUALS for govt. surplus gear – $6.50 each: R-390/URR, R-220/URR, URM-25D, CV-591A/URR, CV-278/GR, TRM-1, TS-382D/U, TS-497B/URR, TT-63A/FGC, URM-32. W3IHD, 7218 Roanne Drive, Washington DC 20021.

LEARN DESIGN TECHNIQUES Electronics Monthly Newsletter. Digital, linear construction projects, design theory and procedures. Sample copy $1.00. Valley West, Box 2119-E, Sunnyvale CA 94087.

MIX PLEASURE with pleasure at the Hamburg International Hamfest on Sept. 21. For information contact Lin Brownell WB2HCL, 210 Buffalo, Hamburg NY 14075

AUTOMATIC TELEPHONE answering computer. The best available. List $239.95. I have two new and still in boxes for $150.00 each. Warranty is still good. First check takes one or both. WB8CTA, 1000 Moore Road. Conway MI 49722.

WYOMING RANCH LAND. No QRM-QRN. Wild horses, antalope, deer. 10 acres – $25 down, $25 monthly. Owner – Michael Gauthier K6ICS, 9418 Florence, Downey CA 90240.

BUY-SELL-TRADE Write for monthly mailer. Give name address call letters. Complete stock of major brands new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc. SSB and FM. Associated Radio, 8012 Conser, Overland Park KS 66204. 913-381-5901.

FOR SALE: New Drake R4-C with 4N.B, AM-filter package $600.00. Call Jim W1VYB (617) 922-3850.

JULY ISSUE of 73 Magazine introduced new Keeps It Kits. Now, good news: if a "U" shaped bracket mounts your rig, protection available with kit, regardless of make!! Basic concepts unchanged. Order today. Free bonus: include call sign and receive attractive engraved call plate.

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding, literature Estes Engineering, 543-A West 184 Street, Gardena CA 90248.

FOUNDATION for Amateur Radio annual hamfest Sunday, October 20, 1974 at Gaithersburg Maryland Fairgrounds.

MOTOROLA PORTABLES Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal services, 6663 Industrial Loop, Greendale WI 53129.

MASSACHUSETTS HAMS! Large supply of two meter crystals and accessories in stock. Authorized distributor for ICOM, Standard and Genave radios. Kensco Communications Inc., 46 Pearl Street, Quincy MA 02169 (617) 471-6427 (only 10 miles south of Boston).

HW101, SB600, HP23A: First money order or cashiers check for $330.00, will ship UPS postage collect. 73 Magazine, Peterborough NH 03458.

FREE: 12 extra crystals of your choice with the purchase of a new Regency HR-2B at $229. Send cashier's check or money order for same-day shipment. For equally good deals on Collins, Drake, Kenwood, Standard, Clegg, Swan, ICOM, Genave, Hallicrafters, Tempo, Midland, Ten-Tec, Venus Hy-Gain, CushCraft, Mosley, and Hustler, write to Hoosier Electronics your ham headquarters in the heart of the Midwest. Become one of our many happy and satisfied customers. Write or call today for our low quote and try our individual, personal service. Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. (812) 894-2397.

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This is amateur radio week in Bermuda. Oct. 16th: annual meeting of the Radio Society of Bermuda. Oct 18: annual RSGB dinner at Holiday Inn, St. Georges honoring the winners of the Bermuda Contest. Oct 19 20 portable operation of VP9BS in the Scout Jamboree. To get a license to operate in Bermuda write to the Radio Society of Bermuda, Box 275, Hamilton Bermuda. Travel and lodging should be arranged with your local travel agent.

LAST MINUTE FCC RELEASES

In the matter of

Authorization of commemorative stations in the Amateur Radio Service.

Docket No 20111

NOTICE OF PROPOSED RULE MAKING

Released: July 24, 1974

By the Commission: Commissioner Lee concurring in the result: Commissioners Quello, Washburn and Robinson not participating.

1. Notice of Proposed Rule Making in the above captioned matter is hereby given.

2. The Commission in this action is proposing to adopt rules which will liberalize and clearly delineate the provisions under which amateur operators may obtain a commemorative station license. Under the present rules and policies, a special event authorization is issued only when an applicant can show the event is of general public interest of at least a statewide basis. Many applicants have been unable to meet this criteria even though the event may have been very significant to a particular group of people.

3. To alleviate this problem, our proposed rules would establish a new class of amateur station, i.e., commemorative station, which would be issued for any celebration that is either unique, distinct and of general interest to the public or amateur operators. The primary purpose of this station would be to bring public notice to the Amateur Radio Service by allowing an amateur station with a distinctive call sign to be operated at an event or celebration so as to help attract more contacts.

4. The specific licensing requirements for a commemorative station are set forth in the Appendix in §97.41. Essentially stated, an Amateur Extra or Advanced Class licensee will be allowed to file an application in letter form for a commemorative station, giving the details of the authorization desired. While our proposed rules would permit the use of multiple transmitters at a station, portable or mobile operations would be prohibited. A commemorative station will not be licensed for any amateur operating contest.

5. The effect of our proposed rules is to remove authorizations for commemorative stations from the category of Special Temporary Authorization. Under our proposed rules, they would constitute a formal class of amateur station and thus the usual application fees will be imposed. The regular new station application filing fee would be required, and in addition, if a specific call sign is requested, the usual special call sign fee would be required. We believe that the imposition of these fees is appropriate in view of the amount of processing time involved with these applications.

6. Authority for the proposed rule changes herein is contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended, and Title V of the Independent Offices Appropriations Act of 1952.

7. Pursuant to applicable procedures set forth in § 1.415 of the Commission's Rules, interested persons may file comments on or before October 30, 1974 and reply comments on or before November 16, 1974. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision on the rules which are proposed herein, the Commission may also take into account other relevant information before it, in addition to the specific comments invited by this Notice.

8. In accordance with the provisions of § 1.419 of the Commission's Rules and Regulations, an original and 14 copies of all comments, pleadings, briefs, or other documents shall be furnished the Commission.

9. All filings made in this proceeding will be available for examination by interested parties during regular business hours in the Commission's public reference room at its headquarters in Washington, D.C., (1919 M Street, N.W.)

APPENDIX

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

1. §97.3(i) is amended to add a new definition "Commemorative station" immediately after Repeater station to read as follows:

§97.3 Definitions.

(i) * * *

Repeater station.

Commemorative station. Station licensed at a specific land location for operation in commemoration of a celebration which is unique, distinct, and of general interest to either the public or to amateur radio operators, for the purpose of bringing public notice to the Amateur Radio Service.

2. §97.40(c) is amended to read as follows:

§97.40 Station license required.

(c) An amateur radio operator may be issued one or more additional station licenses, each for a different land location, except that repeater station, control station, auxiliary link

Cont'd

station, and commemorative station licenses may be issued to an amateur radio operator for land locations where another station license has been issued to the applicant.

3. Sections 97.41(a) and 97.41(g) are amended and §97.41(f) is added to read as follows:

§97.41 Application for station license.

(a) Each application for a club or military recreation station license in the Amateur Radio Service shall be made on the FCC Form 610-B. Each application for any other amateur radio license, except a commemorative station, shall be made on the FCC Form 610.

(f) An application by letter to the Amateur and Citizens Division, Federal Communications Commission, Washington, D.C. 20554, may be made by an Advanced Class or Amateur Extra Class licensee for one commemorative station for the period of the celebration, but not to exceed 30 days unless extraordinary circumstances are shown. The request letter shall contain the following:

(1) The name, mailing address, photocopy of amateur operator license, and signature of applicant.

(2) The name and description of the celebration, its significance to the public or to amateur radio operators, and the justification for the proposed commemorative station.

(3) The location of the proposed station.

(4) The dates the station will be operated, and justification.

(5) Specific call sign requested, if desired.

(g) One application and all papers incorporated therein and made a part thereof shall be submitted for each amateur station license. If the application is only for a station license, other than a commemorative station, it shall be filed directly with the Commission at its Gettysburg, Pennsylvania office. If the application also contains application for any class of amateur operator license, it shall be filed in accordance with the provisions of §97.11.

4. §97.51(a)(4) is amended to read as follows:

§97.51 Assignment of call signs.

(a) * * *

(4) A specific unassigned call sign may be temporarily assigned to a commemorative station.

5. In §97.95 the headnote is revised and §97.95(a)(i) is amended to read as follows:

§97.95 the Operation away from the authorized fixed operation station location.

(a) * * *

(1) When there is no change in the authorized fixed operation station location, an amateur radio station other than a military recreation, auxiliary link, or commemorative station, may be operated under its station license anywhere in the United States, its territories or possessions, as a portable or mobile operation, subject to §97.61.

In the Matter of

Amendment of Part 97 regarding the automatic control of repeater stations in the Amateur Radio Service.

Docket No. 20112

NOTICE OF PROPOSED RULE MAKING

Released: July 25, 1974

By the Commission: Commissioners Washburn and Robinson not participating.

1. Notice of Proposed Rule Making is hereby given in the above entitled matter.

2. The Commission is considering amendments to the rules for the Amateur Radio Service to provide for automatic control of repeater stations. Every amateur radio station, including all repeater stations, has always been required to have a control operator at an authorized control point when in operation. In the Report and Order, in Docket 18803, 37 FCC 2d 225 (1972) we predicted advancements in amateur remote control and automatic control would necessitate further rule making in the matter of repeater control. Interested parties having information and suggestions in these areas were urged to submit them to us for consideration. We are appreciative for the helpful response from those amateurs and organizations doing so. In particular, we are grateful to several amateur licensees for their experiments in semi-automatic and automatic repeater control, and to the American Radio Relay League for their suggestions. This information, together with our awareness of the vast improvement in the amateur remote control methods in recent months, leads us to believe there is an appropriate basis for moving forward in this area.

3. By the term control, as used herein, we mean the techniques for accomplishing the prerequisite responsibility for the proper operation of an amateur radio station in compliance with the rules. A control operator, whether or not the station licensee, at a control point located adjacent to the station transmitter, in the classic concept of amateur radio operation is performing local control. If he is at a distant control point, he is performing his functions by remote control through operator on duty at all times is used to control a station, we consider this to be automatic control. Only repeater stations and auxiliary link stations used in repeater systems are being proposed for automatic control in the Amateur Radio Service.

4. Because of the unique privileges authorized, there are special responsibilities incumbent upon the licensee and the control operator of remotely controlled stations and repeater stations. Unlike most other radio services, we do not assign specific operational frequencies to amateur stations. All amateur frequencies are available, depending upon one's operator license class, on a first come, first served basis. Most of these frequencies must be shared by amateurs throughout the world, using all types of emissions, for a variety of amateur purposes. Moreover, some frequencies must be shared with non-amateur stations. The fundamental means for making such a system practical is that the control operator of each amateur station selects any specific operating frequency by first determining there are no communications already thereon. In the event there are, he either waits for that frequency to clear, or moves to an unoccupied frequency. Indiscriminate frequency selection can result in non-compliance with §97.125 which prohibits deliberate interference. While there may be some advantages in discontinuing this system in favor of frequency assignments for repeaters, and possibly other kinds of amateur stations, we believe the traditional method continues to be the best one for the Amateur Radio Service. Coordination of operating frequencies among amateurs is necessary, however, to make the most effective use of the allocated bands. Licensing a station for remote control does not imply any less control is required. The basic premise for permitting remote control of an amateur radio station is that amateur technology is adequate to provide the same degree of control over a remotely controlled station, in so far as compliance with the rules is concerned, as does local control.

5. In most amateur repeater stations which have come to our attention, efficient operation has been achieved through persistent self-enforcement efforts by the amateurs involved. Unfortunately, for a few stations this is not the situation. The control operator of a repeater station has additional responsibilities even beyond those incumbent upon the control operator of a non-repeater station. He has the job of screening out prohibited practices, such as

More, more...

Docket 20112 cont'd

music, broadcasting, commercial traffic, etc. While the repeater may not be the originator of these types of transmissions, the repeater station licensee and control operator are nonetheless responsible for the proper operation of the station. They must receive a high degree of cooperation from other amateurs making use of the station, in order to make repeater stations in the Amateur Radio Service practical. While the control operator must make certain that other radio signals, either amateur or non-amateur, not intended for retransmission are not repeated, it should be obvious to all amateurs that transmissions in the repeater segments of the amateur frequency bands should be limited to those intended to be retransmitted. This is particularly true for transmissions in the frequency regions where the generally accepted repeater input channels are situated, such as 146.01 – 146.46 MHz and 147.60 – 147.99 MHz. Stations conducting simplex communications on these frequencies in areas where their transmission could be repeated should expect them to be repeated.

6. Some amateurs have developed a number of techniques to relieve the control operator from personally performing many routine contro functions. For instance, several remotely controlled repeater stations use devices to disable the repeater transmitter in order to prevent interference to other stations already transmitting on the frequency. Other repeaters use secondary control systems, ranging from simple to complex, to limit access to the repeater to users of their choice. Still others use devices to monitor the technical performance of the station, which automatically shuts down the station if it is not within the desired standards. An automatic recorder is often used for logging third party traffic activity. The use of such techniques appear to make automatic control of an amateur repeater station practical. This is being domonstrated under Special Temporary Authorization by several amateur repeater stations.

7. In some, if not most, amateur repeater stations, where full cooperation by the users is obtained, the control operator's function is usually completely passive. He only needs to monitor the communications to verify the continuing proper operation of the station. We suspect, in such instances, the necessity for real time monitoring by a control operator may be unnecessary. These stations can operate properly under automatic control, with the monitoring accomplished on a delayed basis. Regrettably, from the types of problems encountered by some repeater stations that have come to our attention, it is apparent that not all repeater stations would be able to operate by automatic control at all times. Where the equipment is not sufficiently reliable to leave unattended, or where the necessary automatic functions are not incorporated, or where full cooperation by the users is not obtained, automatic control is not practical. For these stations, operation by local control or remote control is the only practical means, at least during certain time periods when the violations would otherwise occur.

8. Therefore, we are proposing to expand the definitions in §97.3(n), as shown in the Appendix, to include automatic control, in addition to local and remote control. Automatic control would only apply to repeater stations as described in the foregoing, and to certain auxiliary link stations used in conjunction with repeater stations under this type of control. New §97.110(c) and §97.111(g) would be added to provide for these new types of control.

9. In order to operate a repeater station by automatic control, the station would first be licensed as a repeater station, in the conventional manner, for either local control or for remote control. Specific authorization

More 20112? Yep

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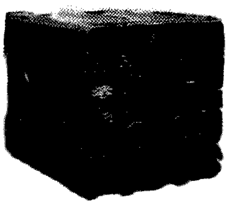

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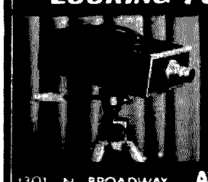

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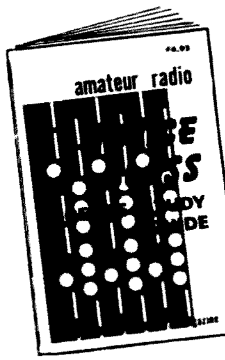

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FCC's 20112 - cont'd

for automatic control would not be required. However, certain privisions must be effected, as set forth in detail in the Appendix. These include a requirement that sufficient information must be filed with the Engineer in Charge to enable him to order a station shutdown should the need arise. The control operator designated by the repeater station licensee must be available on call at all times the station is under automatic control. All radio communications through an automatically controlled repeater must be recorded and reviewed within 72 hours by the control operator(s), for rule compliance. In the event violations did occur, the licensee would be obligated to take the steps necessary to prevent a recurrence, or else may only operate the station by local or remote control. Should the improper operation of a repeater station while under automatic control come to our attention, we would then impose restrictions against further automatic control of that station until such time as the licensee can show that future operation of the station by such control will result in compliance with the rules.

10. Depending upon the actual situation, there are several steps the licensee of a repeater station desiring to operate his station by automatic control can take to preclude many of the abuses encountered with amateur repeaters. For instance, if commercial third party traffic by automatic telephone system interconnect becomes a problem, this function could be discontinued during periods of automatic control. The repeater might have to be restricted to only emergency communications, if other means to secure the cooperation of all users are not successful. Possibly, the repeater could only be operated by automatic control during certain periods each day, such as during the late night hours. Another method is to employ a semi-automatic control system, where access to the repeater is only possible for those users selected by the station licensee. Undoubtedly, the imagination and ingenuity of amateurs can devise even more methods to solve these and other problems. However, proper operation of a repeater station by automatic control would always depend heavily upon cooperation from others. The self-policing claims and reputation long associated with amateurs would be thoroughly tested by this proposed method of repeater control.

11. The specific rule changes proposed herein are set forth in the attached Appendix. Authority for these proposed amendments is contained in Section 4(i) and 303 of the Communications Act of 1934, as amended.

12. Pursuant to applicable procedures set forth in § 1.415 of the Commission's Rules, interested persons may file comments on or before October 30, 1974, and reply comments on or before November 16, 1974. In accordance with the provisions of § 1.419(b) of the Commission's Rules, an original and fourteen copies of all statements, briefs, and comments filed shall be furnished the Commission. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken. The Commission may also take into account other relevant information before it, in addition to specific comments invited by this Notice. Responses will be available for public inspection during regular business hours in the Commission's Broadcast and Docket reference Room at its Headquarters in Washington, D.C.

APPENDIX

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

○ § 97.3(n) is amended to read as follows:

§ 97.3(n) Definitions

(n) Control. Techniques for accomplishing the prerequisite responsi-

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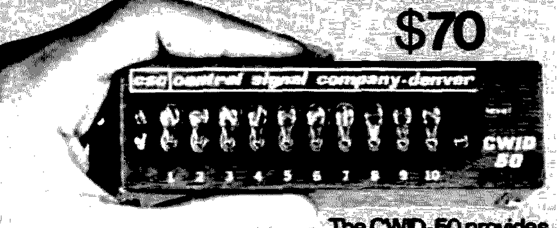

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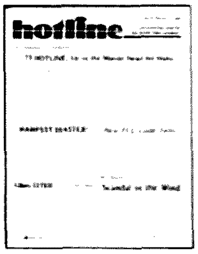

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bilities in the immediate operation of an amateur radio station. Must be one or more of the following:

Local Control. Manual control, with the control operator monitoring the operation on duty at the control point located at the station transmitter(s), such that the associated operating adjustment are directly accessible. (Direct mechanical control, or direct wire control of a transmitter from a control point located on board any aircraft, vessel, or on the same premises on which the transmitter(s) is located, is also considered local control).

Remote Control. Manual control, with the control operator monitoring the operation on duty at a control point located elsewhere than at the station transmitter(s), such that the associated operating adjustments are accessible through a control link.

Automatic Control. The use of devices and procedures for control such that the duty control operator does not have to be present at the control point at all times. (Only rules for automatic control of repeater station systems have been adopted. Automatic control of all other types of amateur radio stations must be approved by the Commission on a case-by-case basis).

2. § 97.79(b) is amended to read as follows:

§ 97.79 Control operator requirements.

(b) Every amateur radio station, when in operation, shall have a control operator. The control operator shall be on duty at an authorized control point, except where the station is under automatic control. The control operator may be the station licensee, if a licensed amateur radio operator, or may be another amateur radio operator with the required class of license and designated by the station licensee. The control operator, when on duty, shall also be responsible, together with the station licensee, for the proper operation of the station.

3. Add new § 97.110(c) to read as follows:

§ 97.110 Operation of an auxiliary link station.

(c) An auxiliary link station(s) licensed either for local control or for remote control, may also be operated under automatic control when it is licensed in a repeater station system being operated under automatic control. Both the auxiliary link stations(s) and the repeater station must appear on the system network diagram on file with the Commission.

4. Add § 97.111(g) to read as follows:

§ 97.111 Operation of a repeater station.

(g) A repeater station licensed either for local control or for remote control, may also be operated under automatic control. Both the auxiliary link stations(s) and the repeater station must appear on the system network diagram on file with the Commission.

4. Add § 97.111(g) to read as follows:

§ 97.111 Operation of a repeater station.

(g) A repeater station licensed either for local control or for remote control, may also be operated under automatic control where:

(1) Devices and procedures have been implemented such that compliance with the rules can be accomplished without the duty control operator present at the control point at all times the station is in operation.

(2) All radio communications transmitted by the station are monitored by the duty control operator in real time, or reviewed within 72 hours. In the event a violation is detected, the repeater station licensee must take the necessary steps to prevent a recurrance.

(3) All radio communications transmitted by the station are recorded such that they can be reproduced. The recordings shall be:

(i) Preserved for a period of at least 30 days,

(ii) Retained in the possession of the station licensee, and

(iii) Made available to the Commission upon request.

(4) The name of the station licensee, and the names of designated control operators, together with appropriate information so the duty control operator may be readily notified by Commission personnel to effect a prompt shutdown of the station, has been filed with the Engineer in Charge of the radio district in which automatic control of the station(s) is intended. This notification shall have been filed within the past year, or at the time of any change thereto, whichever is most recent.

(5) Upon notification from the Engineer in Charge, or other Commission Representative, of improper station operation under automatic control, said operation must be immediately discontinued until all deficiencies have been corrected and the Commission so notified. Otherwise, the station(s) may only be operated under local control, or under remote control if authorized.

In the Matter of

Amendment of Part 97 of the Commission's Rules to permit crossband operation or repeater stations.

Docket No. 20113
RM-2327

NOTICE OF PROPOSED RULE MAKING

Released: July 24, 1974

By the Commission: Commissioners Washburn and Robinson not participating.

1. Notice of Proposed Rule Making in the above-entitled matter is hereby given:

2. The Commission has under consideration a petition (RM-2337) filed by the American Radio Relay League (ARRL). Petitioner requests the Commission to issued an Order modifying the second sentence of § 97.111(c) so as to permit repeater stations to be operated crossband, i.e., permit a repeater station to utilize an output (transmitter) frequency within a different frequency band than the input (receiving) frequency. The present rule requires both the input and output be within the same frequency band.

3. The ARRL suggests that a formal rule making proceeding is unnecessary for the proposed amendment since it would provide a relief from a present restriction. Although no specific statuatory authority is cited, peitioner must reply upon § 553(b) of the Administrative Procedure Act, 5 U.S.C., and § 1.412(c) of the Commission's Rules, as authority to support his position. Pursuant to those subsections, general notice of proposed rule making must be published except in certain limited instances. Petitioner does not show that the proposed rule modifications comes within those exceptions, and we do not believe any such exception could apply. Moreover, even if we put aside the requirements of the § 553(b) and further assume arguendo that every amateur licensee who operates or is interested in amateur. repeater stations favors this proposed rule amendment, it is possible that this change will adversely affect the interests of other amateur operators, and they should be allowed to comment and express their views.

4. In support of the requested amendment, the ARRL offers the following claims and arguments:

A. Crossband operation of a repeater station having, for example, an input frequency in the 146-148 MHz band and an output frequency in the 222-225 MHz band, could reduce the costs of repeater stations and make more channels available. Repeaters using the wider frequency separation between the input and the output could benefit greatly through the alleviation of a receiver desensitization problem, a difficult one for

Docket 20113 more...

amateurs to solve without considerable expense. Moreover, the present number of repeater input channels could be greatly expanded through the use of narrower channel spacing in the 146-148 MHz band, together with repeater input receivers with the necessary selectivity. Wider channel spacing of the repeater 222-225 MHz output channels would still permit the use of low cost mobile and hand-held units because of the relatively less selectivity required in the receiver section.

B. More efficient use of the spectrum could result. Crossband operation could make the use of other bands more practical, particularly in the frequency band 1215-1300 MHz.

C. Crossband operation of repeaters would permit amateurs to experiment with more sophisticated communications and new control procedures.

5. The request presented by the ARRL may have some merit. Our reason for the adoption of the rule prohibiting crossbanding, as stated in the Report and Order in Docket 18803, was to conserve frequency spectrum. The ARRL scheme for repeater stations to crossband a single channel would still only require one frequency pair, the same as required for a repeater not crossbanded. Their plan to use crossbanding as a means to provide more repeater channels within the same frequency segments would be an improvement in terms of spectrum conservation insofar as repeaters are concerned. How widely this scheme will be accepted by amateurs remains to be seen, since it could require substantial modifications to existing equipment. Also, it would probably result in the discontinuation of simplex segments in the repeater bands, which would not be an improvement in spectrum conservation. Furthermore, it is doubtful whether the costs saved in duplexing equipment would even be offset by the costs required to retrofit all of the users' equipment. It would appear that the more typical application of crossbanding, at least for the near future, would be the addition of one or more input and output frequency channels to an existing repeater. For example, a frequency pair in the 442-450 MHz repeater band might be added to an existing repeater already operating in the 146-148 MHz band. There would then be the capability for an amateur using a 146-148 MHz transceiver to communicate with another amateur using a 420-450 MHz transceiver by means of the crossband repeater. In densely populated areas, the additional unoccupied frequency pairs required may not be available, as pointed out by the ARRL. However, in less populated areas, they would be available, and it is in these areas that crossbanding would have its greatest appeal.

6. Amateur repeater stations, at least as they are presently used, fundamentally provide a party line type of operation. That is, only one user can be retransmitted at a time while all others wait their turn. Consequently, there is a limit on the number of users any one repeater can accommodate, regardless of whether the repeater utilized 1, 2, 3, or more frequency pairs. As the limit is approached, user time would become so minimal and waiting time would become so excessive, in most instances it would become a necessity to terminate crossband operation in favor of independent repeaters. For this reason, we suspect there may be no need for the prohibition against crossband operation.

7. Crossband operation by repeater stations would be limited to those frequency bands authorized for repeater operation. New §97.126 in Subpart E, Prohibited Practices and Administrative Sanctions would incorporate the current policy on other types of retransmissions. Only repeater stations, auxiliary link stations, and certain remotely controlled stations are licensed to automatically retransmit the radio signals of other amateur stations. By the term automatic retransmit, we mean retransmitting other signals in real time or very near real time. The best example of this is the type of retransmission performed by amateur repeater stations. An example of a prohibited practice would be the retransmission on the 14.0-14.35 MHz amateur band of another amateur station transmitting on the 144-148 MHz band, or vice versa. However, it is completely proper for an amateur operator at one station to receive a message from another station, and then later send the same message to a third station, such as done in many amateur traffic networks.

8. Authority for the proposed rule changes herein is contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended.

9. Pursuant to applicable procedures set forth in §1.415 of the Commission's Rules, interested persons may file comments on or before October 30, 1974 and reply comments on or before November 16, 1974. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision on the rules which are proposed herein, the Commission may also take into account other relevant information before it, in addition to the specific comments invited by this Notice.

10. In accordance with the provisions of §1.419 of the Commission's Rules and Regulations, an original and 14 copies of all comments, pleadings, briefs, or other documents shall be furnished the Commission.

11. All findings made in this proceeding will be available for examination by interested parties during regular business hours in the Commission's public reference room at its headquarters in Washington, D.C., (1919 M Street, N.W.)

APPENDIX

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

1. §97.111(c) is revised to read as follows:

§97.111 Operation of a repeater station.

(c) A repeater station may concurrently retransmit amateur radio signals oh more than one frequency band authorized for repeater stations, but may not concurrently retransmit on more than one frequency channel within the same frequency band. A repeater station authorized to operate in conjunction with one or more auxiliary link stations for relaying radio signals, received at another location(s), to the repeater station may utilize input (receiving) frequencies not available for repeater stations, provided the input frequencies to the auxiliary link station(s) are in frequency bands authorized to repeater stations.

2. New §97.126 is added to read as follows:

§97.126 Retransmitting radio signals
No amateur radio station, except a properly licensed repeater station, auxiliary link station, or a remotely controlled station in a system with an auxiliary link station, may automatically retransmit the radio signals of other amateur radio stations.

Please send copies of your comments on these Dockets to 73 Magazine, Peterborough NH 03458.

NEW VHF HANDBOOK

Once in a while 73 staffers agree that a new book is worthy of review even though 73 didn't publish it. Such is the case where W9EGQ (Herb Brier) and W6SAI (Bill Orr) collaborated on a VHF Handbook.

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PROPAGATION CHART

J.H. Nelson

Good (open) Fair (□) Poor (O)

September — 1974

Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
1	2	$\boxed{3}$	$\boxed{4}$	5	6	$\boxed{7}$
$\boxed{8}$	$\boxed{9}$	$\boxed{10}$	11	12	13	14
15	$\boxed{16}$	$\boxed{17}$	$\boxed{18}$	$\boxed{19}$	$\boxed{20}$	21
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EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7A	7	7	3	3	3	7	7	7	14	14
ARGENTINA	14	7A	7B	7	7	7	14	14	14	14	14A	14A
AUSTRALIA	14	7A	7B	7B	7	7	7	7	7	7B	14	14
CANAL ZONE	14	7	7	7	7	7	14	14	14	14	21	21
ENGLAND	7	7	7	7	7	7B	14	14	14	14	14	7B
HAWAII	14	7A	7B	7	7	7	7	7B	14	14	14	14
INDIA	7	7	7B	7B	7B	7B	14	14	14	7B	7B	7B
JAPAN	14	7B	7B	7B	7B	3B	7	7	7	7	7	14
MEXICO	14	7	7	7	7	3A	7	14	14	14	14A	14
PHILIPPINES	14	7B	7B	7B	7B	3B	7	7	7A	7A	7B	14
PUERTO RICO	7	7	7	7	7	7	14	14	14	14	14	14
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U. S. S. R.	7	3	3	7	7	7B	7A	14	14	14	7B	7B
WEST COAST	14	7A	7	7	7	7	7	14	14	14	14	14

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	3	3	3	7	7	7A	14	14
ARGENTINA	14	14	7B	7	7	7	7A	14	14	14	14A	14A
AUSTRALIA	14	14	7B	7B	7	7	7	7	7	7B	14	14
CANAL ZONE	14	14	7	7	7	7	7	14	14	14	21	21
ENGLAND	7	7	7	7	7	7	7B	14	14	14	14	7B
HAWAII	14	14	7B	7	7	7	7	7	14	14	14	14
INDIA	7	7	7B	7B	3B	3B	7B	7B	7A	7	7	7
JAPAN	14	14	7B	7B	3B	3B	3	7	7	7	7	14
MEXICO	14	7	7	7	7	3A	7	7A	14	14	14	14
PHILIPPINES	14	14	7B	7B	3B	3B	3B	7	7	7	7B	14
PUERTO RICO	14	7	7	7	7	3	14	14	14	14	14	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14	14	14
U. S. S. R.	7	3	3	3	3	3B	7B	7B	14	14	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	3	3	3	7	7	7	7A	14
ARGENTINA	14	14	7B	7	7	7	7B	14	14A	21	21	14A
AUSTRALIA	21	21	14	7B	7	7	7	7	7	7B	14	14
CANAL ZONE	14A	14	7	7	7	7	7	14	14	14	14	21
ENGLAND	7	7	7	7	7	3B	7B	7B	14	14	14B	7B
HAWAII	14A	14A	14	7A	7	7	7	7	14	14	14	14
INDIA	7A	14	7B	7B	3B	3B	3B	7B	7	7	7	7
JAPAN	14	14	14	7B	7	7	3A	7	7	7	7A	14
MEXICO	14	14	7	7	7	7	7	7A	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	3A	7	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	3B	7B	14	14	14	14	14
U. S. S. R.	7B	3B	7	7	3	3B	3B	7	7A	7A	7B	7B
EAST COAST	14	7A	7	7	7	7	7	14	14	14	14	14

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

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NEVER SAY DIE

... de W2NSD/1

EDITORIAL BY WAYNE GREEN

JY1 VISITS CANADA

CARF arranges special licensing

Doug Burrill VE3CDC, the Vice-President of the Canadian Amateur Radio Federation, had his work cut out for him getting through yards of official red tape to set up things so His Majesty King Hussein (JY1) could get on the air while on his visit to Canada in mid-August. He did manage this and was able to arrange for a nice letter to be presented to Hussein from the CARF Secretary VE3CRL informing him that this had been set up. You can bet that amateurs around Ottawa and Vancouver, the two major areas that JY1 would be visiting, were keeping their receivers warm.

INVOLVEMENT IS CRITICAL

In talking with FCC officials recently it evolved that one of the more serious problems facing them is the apathy of amateurs in providing feedback on proposed rules and regulations.

Quite a bunch of proposed rule makings and dockets have been released in recent weeks and the FCC not unreasonably expects amateurs to be interested enough to send in their comments on them.

For instance there was a proposal that the prohibition against linking repeaters be removed. Now this has been a sore point with repeater groups ever since the rule appeared in Docket 18803 – not that many repeaters have any wish or need to link up, just that the prohibition didn't make any sense and few repeater groups felt that the restriction did anything but discourage experimentation and initiative. But now that the FCC has replied to these criticisms by offering to delete the restriction, repeater groups have almost totally ignored the whole matter. There are over 1100 licensed repeaters in the country at present and every single one of these groups should move heaven and earth to make sure that their group sends in a comment on every repeater oriented docket and rule making – plus as many individual comments as possible. If the original and 14 copies is just too, too much to handle, at least send in a lousy post card!

The fact is that we take a lot of space in 73 to print the FCC dockets – space that we would prefer to use for a couple more construction projects – but we do it because we know (and you know too) that the only way we will get the rules we want and need is if we keep Washington informed on what we want. When we take the pages to print those dockets it is your responsibility to read them carefully – and further you should make damned sure that they are read at the next club meeting and discussed, complete with a letter from the club secretary expressing the opinion of the club.

Take the Races docket which was published in the August issue of 73 on page 6. Nothing much there that your club would be interested in, right? I'll bet no one even read the docket through to see what was happening – after all, who cares what Races is doing? Well, fellows, the word from the FCC is that you darned well better read that docket and get yourself into gear, for that one is a little sleeper which could have a few thousand non-ham operators sitting there using our ham bands.

This has, according to reports, already been happening in the Chicago area. Races stations have appeared using Races calls and been chatting away happily on two meter FM, telling objecting hams to mind their own business. I wonder how many clubs in Illinois have gone to the trouble to find out what their state has submitted to the FCC by way of comments on the Races docket? Are they aware that Illinois wants to take all those nice ham band frequencies allocated to Races and make them into local government bands? Are they aware that this is the official proposals of their state? That could mean local government use of 2m and 75m! What does your local government intend to do about Races? Many want these valuable frequencies, but don't want to be bothered by having to have amateurs to use them.

In September we had a bunch more dockets – one on special call signs for Extra Class licenses – one on relaxed logging. I assume that virtually everyone likes the idea of simpler logging, but how many have written to the FCC with comments? This could easily end up lost to us because the only ones who bothered to write in happened to be a couple of hidebound conservatives who think that because their grandfathers had to log everything, we should too.

Also in September there was a docket on commemorative stations, one on automatic control of repeaters and one on crossbanding of repeaters. The first one of those will be of little interest to you or to clubs until some time in the future when you decide that it is time to put on a special event station – then? What can I say about repeater groups and FMers who griped about docket 18803, who fumed at the restrictions, and then go happily on their way ignoring the FCC's attempt to put things to rights? You may be sure that there will be a few negative votes cast on each of these dockets – and there is a good possibility that they will carry the day – just because no one else even bothered to send in comments.

SSTV TAPES NEEDED

SSTVers who work up an interesting program are asked to make a duplicate tape and send it to 73 Magazine so it can be further duplicated and used for demonstrations by dealers and at hamfests. There is just too little available that is of value for this application – and remember, the more that we are able to get interesting SSTV programs shown around, the more SSTVers we will have.

A demo tape is available now from 73 for this use, but it is not as long as we would like, and it needs more interesting material – so, how about it?

IOWA FURIOUS WITH FCC

The police in Iowa have been getting more and more frustrated by the use of CB by truckers to thwart the speed limits and other state laws. Recently they got the cooperation of a team of FCC agents and arranged a mass inspection of trucks with CB antennas. The FCC did inspect, but instead of doing anything to help Iowa with their policing problem, all the FCC fellows did was hand out CB license applications to those truckers who had CB radios and no licenses. Iowa figures that by issuing mere warnings instead of taking action against illegal CBers is encouraging illegal use of the CB radios. They feel that truckers will ignore any agency that goes around saying, "Naughty, naughty."

WANTED!

A number of people are most anxious to find out where Keith Lamonica W7DXX (also known as Bob Keith) is located. If you hear him on the air (2m FM is most likely) or hear him announcing over your local radio station, please drop a line to 73

immediately. His last known whereabouts was in Huntsville, where he worked for several television stations. He may be in the Birmingham area – or almost anywhere.

... W2SND

FCC NEWS

Adopted: June 11, 1974

1. Because not all remotely controlled amateur radio stations are additional stations, it is inappropriate to present the rules for remotely controlled stations under the undesignated headnote *Operation of Additional Stations* in Part 97, Subpart D. For this reason, the rules for the operation of a remotely controlled station are relocated, with only minor editorial revision, from § 97.108 to a new § 97.88 under the undesignated headnote *General.*

2. Because this amendment relates to editorial revisions only, prior notice of rule making public procedure and effective date provisions are unnecessary, pursuant to the Administrative Procedure and Judicial Review provisions of 5 U.S.C. 553.

3. Accordingly, IT IS ORDERED, pursuant to § § 4(i), 5(d), and 303 of the Communications Act of 1934, as amended, and § 0.231(d) of the Commission's Rules and Regulations, that effective June 21, 1974, Part 97 of the Commission Rules is amended as above.

FCC
John M. Torbet
Executive Director

CB RULE CHANGE

Docket 20118, released July 31, proposes to change the CB rules to prohibit the marketing of external rf amplifiers capable of operating in the 11 meter band. They will prohibit the sale, lease, offer to sell or lease, import or even the shipping of these amplifiers. It would also prohibit the use.

The exception would be rf amplifiers made for amateur radio, and these would have to be multi-band.

The deadline for comments on this Docket is September 30th, which seems a bit too soon. The September issue of 73 (presumably the other ham magazines) had gone to press, which means that the earliest issue which could carry this Docket would be the October issue. In turn this would mean that many amateurs who might like to comment upon the Docket in view of its restrictions on amateur rf amplifiers (though the restrictions are not particularly onerous) will be unable to meet the deadline.

Docket 20119, released July 31, proposes changing the Part 15 (low power unlicensed transmitters) from the 11m CB band (where those little toy 100 mW rigs have been raising Cain, particularly around Christmas before they self-destruct a few weeks later) to a new berth right next to the 6m ham band. The new channels are proposed for 49.9 – 50.0 MHz segment.

If the frequency control of future Part 15 rigs is no better than those of the past (and why should they be?) the 6m ops are in for a lot of garbage on the low end of the band. Of course they may never notice this since the bottom 100 kHz CW band is almost totally deserted, even during the most widespread band openings. There is no reason to expect anything but the cheapest of equipment to be designed and sold for use in this band, so the prospects of wandering carriers is high.

Well, bright-side viewers can look forward to inexpensive hand transceivers which will be easily converted to 6m.

The deadline for comments on this one is also September 30th.

Docket 20120, released July 31, proposes some basic changes in the CB rules. This docket would legislate a changeover to sideband in five years, open up a bunch more channels, and limit CB antennas in many ways, including a 40 Watt power handling capability.

The expansion of the band would add 70 sideband channels and eventually result in 100 channels being available. Antennas would have to be type accepted.

The deadline for comments on this docket is January 30th, which leaves a lot more time than has been left with other recent dockets.

CONVENTION CRITIQUE

The report on the ARRL National in New York which appeared in the Hotline was rather critical of some aspects of the convention – and drew criticism in turn for being critical. The following reprint from the Pack Rats Cheese Bits, the bulletin of the Mt. Airy VHF Radio Club (a consistently well done paper, by the way) is not published here so much to support the Hotline view of the National convention as to provide a valuable set of guidelines for the chairmen of other conventions, for there are some very good suggestions.

A CRITIQUE ON THE NATIONAL

Seven members of Penn ARC and myself, accompanied by WA3PZO drove to the ARRL National Convention in NYC this past weekend. We arrived at 10:00 AM Friday morning staying through until Sunday at 5:00 PM. It was a highly interesting and educational three day weekend. Many good and bad points were noted by our group and are enumerated below for your reference, followed by several recommendations.

All events as listed in the program appeared to be well done, major hangups were not apparent. It is obvious that the Waldorf-Astoria although one of the worlds finest hotels, is not well laid out for a large convention, with miles of carpeted stairways, plush endless corridors, poky elevators, and spotty air conditioning, all popping up in the wrong places. Our Ben Franklin for 1976 will be a much more practical and better suited facility.

Contest Area

Contests were badly neglected with none listed at all in the official program. This could well be a high point for our 1976 convention, as they have been in past years.

Seminars

Many interesting seminars were presented all of which appeared to be well prepared by knowledgeable speakers, however, construction clinics appeared to be missing. Two or three at least would have proven interesting and informative. I would love to see an accomplished homebrewer take a schematic and demonstrate chassis layout, round and square hole punching, soldering etc. Or how about a clinic on soldering co-ax fittings – hardly anyone does it properly. Antenna construction is another. We could go on and on.

Movies/Slides

Except for a private showing of these in one of the hospitality suites none were scheduled. These should be advertised for well ahead of time and

set up in automatic self showing carroselles. Meritorious movies could also be scheduled for appropriate time slots. Always a popular feature at conventions.

Program/Booklet

A glossy paper production with a misleading cover showing a nonexistent hotel bearing no relation to the Waldorf – almost a dead ringer for the Ben Franklin in Philadelphia. Content of the program was as bad as the cover. Open hours of the major exhibits were not mentioned once. Consequently many of us (including me) got stranded Friday night with absolutely nothing to do and no way to contact several people we had planned on meeting. The existence of hospitality suites such as Murphy's Marauders, Long Island DX Assn. was likewise not mentioned. No phone numbers were listed for emergency, or even for just plain getting lost in the hotel. Many times it was practically impossible to figure out how to move expeditiously from seminar to seminar, but no one was stationed anywhere who could help.

Miscellaneous Items

1. Bulletin Boards strategically located in (hopefully) pairs, one for official releases, one for delegates personal items – would have been helpful.

2. Convention officials should wear distinctive armbands, not just lapel pins with ribbons as the latter are often impossible to spot.

3. Advance distribution of certain information, such as floor plans, etc., among key delegates should be attempted.

4. No attempt was made to attract young people. Perhaps a reduced rate with local advertising for Scouts in uniform would be appropriate.

5. Location of all meeting rooms should be clearly shown in the Program.

6. Alternate stairways and toilets should be well posted.

7. Parking and shipping arrangements should be published well in advance.

8. A sales pitch for our convention should be staged at the next National convention to attract the undecided. (Reston, Virginia?)

9. 34/94 special repeater on the roof of the Waldorf was a phenomenal success. Everyone who was anyone had an HT on his belt, and when you tested an exhibitors rig, you could hear your voice all over the hotel. HI. How 'bout it Philly? Perhaps we could do them one better with an operating station — all bands. Any volunteers?

10. New York City was like an oversize regional convention, so lacking in imagination and good old convention "hoopla" (Thanks to W3CL for the word!) that I hereby recommend that ARRL appoint a permanent national (volunteer) Convention Chairman to breathe a little continuity into ARRL sanctioned national conventions.

LETTERS

IRS

My son, John Goodwin WA5ZEK, is a subscriber to your magazine. Since 1954, I have been involved in the preparation of Federal and State Income Taxes. In that time, income tax has grown from nuisance to tyrannical proportions. The people for whom I prepare taxes are primarily working people, wage earners. Income tax is withheld from their wages along with FICA. In our area, a working couple can earn from $10,000.00 to $18,000.00. It is alarming the total taxes withheld from their wages and I grow more angry each tax season, and have cast about as to how I could encourage people to object. Most people are mortally afraid of the IRS as you have pointed out.

It never occurred to me to read "73" for tax information. John called my attention to your articles which I read with eagerness and approval. I am eager to participate in anyway to bring about tax reform, and am open to any suggestions you have to offer. Primarily, the people who feel the same as you and I lack the leadership to act. If you can contact people in my area who are able to assume leadership and bring about organization for concerted action, it would be a step in the right direction. Our first major objective should be removal from office of our own Wilbur Mills, who, as you know, is chairman of the powerful Ways and Means Committee. He is up for election this Fall. Since we were able to topple our Rhodes Scholar in the primaries, it is not too far fetched to think we might displace our Mr. Mills.

The time for action was yesterday; keep the good work going.

Bernice Goodwin
Fort Smith, Arkansas

TAPES GREAT

I have received your 4 code tapes. They are the best yet. I'm using mine for brush-up and they sure fill the bill. I now feel I can build up my speed.

C A. Apland W7ZJC
Lynnwood WA 98036

CASSETTES GREAT

I have your cassette recorder and it works every bit as well as my daughter's, which cost several times more. I still think 73 is the best place to look for anything you might want for a ham.

Edward Seidel, Jr. WA8HGS

DO IT YOURSELF

Bill Hoisington's article "An Automatic and Phone Monitor Control System" in the February 1974 issue of 73 really sparked my imagination. As a result, I would like to propose another project which I am sure would find universal appeal among your readers.

My do-it-yourself construction article involves a small superconducting coil which can be inserted into the electric power meter through the short piece of large conduit between the power meter and the circuit breaker box. Whenever the amateur station is transmitting, a broadband detector turns on a circuit which applies power to the superconducting coil. This produces a strong magnetic field which opposes the field inside the motor of the power meter and stops the meter. A detector circuit, using field effect transistors, measures the amount of current being delivered by the power meter and a control circuit adjusts the magnetic field to just the right amount to stop the meter. The superconducting coil takes quite a large amount of power, but this doesn't really matter since the meter is stopped anyway. Of course, I will absolve the 73 Magazine, its editor and myself of any responsibility by inserting a warning, near the end of the article, that the power company might get a little upset if the meter is stopped when the meter reader happens to come around.

Perhaps this article will spark some other amateur into thinking up a way to use amateur radio to stop the natural gas meter. This will be a little more difficult since this meter does not work on electricity, but some smart ham will surely come up with the answer. From there it would be an easy step to make a unit to work from a mobile rig to stop the meter of a self-service gasoline pump after you have pumped in the first five gallons.

Just think how proud 73 Magazine

could be for publishing detailed instructions on how to use amateur radio to save its readers thousands of dollars which would otherwise have to be paid to these giant industries.

I am awaiting instructions on how to submit the manuscript.

James E. Dalley WØNAP

This is just the sort of innovative engineering amateurs have been noted for down through the years. Yet, one wonders at your lack of creative imagineering in this case – why not go all the way and run that power meter backward so you can get a monthly check from the power company to help you buy a little more ham gear? Doubtless there would eventually be some questions raised, but these would be easily brushed off by the simple explanation that you are merely converting all that radio energy you attract with your antenna back into the power lines and thus conserving energy. What could be more American?. . .ed.

FAN MAIL

For years you have subjected readers of 73 Magazine to your paranoid accounts of your mistreatment at the hands of various parties. Most recently, your principal tormentor has been the IRS. And everyone knows how they use their Gestapo tactics to pursue and persecute the pure of heart!

It has been difficult for me, and I'm sure many other readers, to understand why you have always been the innocent victim of such unwarranted attacks. We have also wondered why you think your personal problems have any place in an Amateur Radio journal.

But now that you have been tried in a Federal court and found guilty, maybe all this will change. "Guilty on twelve counts of tax evasion for signing false returns," the jury said. Not the IRS, nor the FCC nor the ARRL nor the Gestapo. No, Wayne, this was the verdict of 12 good, old Yankee Granite-Staters down Concord way.

If and when you get out of jail why don't you apply for a First District call, like all other New Hampshire residents, confine your efforts to putting out a decent magazine and spend a little time with a good doctor to help clear your mind.

You know, Wayne, all your supposed enemies don't really hate you. This is another of your delusions. The truth is that most of us just feel sorry for you and wish that you had taken up fishing or music. With friends like you, Amateur Radio doesn't need enemies!

John Naylor K6BR
485 Pullman Road
Hillsborough CA 94010

GOOD WORK

Keep up the good work – Ham Radio needs you more than ever –

Rich W9JS
Oregon WI 53575

CODE TAPE

I want you to know that with the help of your code course (5WPM) I passed my code test with only one wrong letter, A C came out N N. I owe it to you and that code tape. . . I'll recommend that tape to anyone that want's to get their Novice ticket.

I also say let's send Wayne Green to Washington as our Amateur Radio Lobbyist. We need you.

Marvin R. Bittner
Jacksonville KY

BOOKS

Serious, qualified, intelligent hams interested in vital fundamentals of life should read the "Fields of Life" by Dr. Harold S. Burr, Ballantine paperback 23559 $1.50 and/or "Design for Destiny" by Ed. W. Russell, Ballantine 23405 $1.25 and then develop suitable direct current amplifiers that are stable so that these Fields of Life can be measured in millivolts with an extremely high input resistance.

Applications are in family planning and as an indicator of disease. It gets down to what really makes us tick and where we go from here. From Ballantine Books Inc., 201 E. 50th St., NYC 10022 plus two bits postage per order.

Charles A Moore XE1CMB

CANADIAN OPERATION

Why leave Amateur Radio behind when you go to visit Canada this year?

Getting a reciprocal license is easy to do. Send a letter for application to: *Department of Communications, 55 St. Clair Avenue East, Toronto 290 Ontario, Canada.* Give them your name, address and class of license. You'll get fast action.

Leo WA1HSO

THOUGHTS ON LICENSING

I've been thinking out licensing changes for hams ever since you discussed the question in July '74 issue of 73.

When you analyze the reason for existence of the spectrum the ham allocations you know damned well that hobbyists couldn't hold such an asset by themselves. I keep recalling what Budlong said in a Seattle talk years ago, "We couldn't hold our bands 5 minutes by ourselves – they're reserved for military emergency use and we simply occupy them until they're required." I'm sure that's correct, although I've never seen the statement in print.

Parenthetically, reflection on that statement amuses the hell out of me when I see how seriously some hams take ourselves and our hobby. Picon, indeed!

Well, to go on. That being the case that we're only keeping the house dusted until the owner returns, it seems obvious to me that the military wouldn't want the ham bands tenanted by a huge group such as sits on the citizens band – they'd simply be too large and too strong politically to dislodge easily when the bands are required in an emergency.

So – the present licensing requirements keep the bands fairly active, but not over active nor politically strong, and most hams have a conscious desire to do the right thing for others, and I'm sure very few would operate illegally if the military needed the bands back. So maybe we ought to leave the licensing system the way it is with only minor changes.

Of the minor changes I think incentive licensing is foolish. It reflects more of the 'taking ourselves too seriously' attitude. And maybe the higher frequencies should have less vigorous code requirements.

John W7SCU

TWO METERS

First of all, thank you for the subscription/books to be used at our hamfest in August.

I know what I am about to say has been said before, but it seems to need repeating again, and again, and again. . . Those who operate 2 meter FM continually mess up on proper identification, operation, etc., etc.

The Ten Commandments of Two Meters

I. Thou shalt not make unidentified transmissions (i.e., keying a *repeater* just to see if you are making it).

II. Thou shalt not pick up another's transmission without a two second pause (quit tailgating – breakers may need the repeater for an emergency).

III. Thou shalt always include the proper region number when mobile or portable (i.e., mobile two; portable five).

IV. Thou shalt identify correctly (i.e., the other guy's call and then your call – and only once every 10 minutes).

V. Thou shalt support thy own repeater for thy usage (no one likes a freeloader – be a supporter).

VI. Thou shalt not hog or abuse another's repeater when visiting in another's area (you are usually welcome, but be a listener more than a user).

VII. Thou shalt not mimmick the repeater's identifier (one need not give the repeater's call or frequencies when listening rpt. or clear rpt. is sufficient).

VIII. Thou shalt not time-out a repeater (no one likes a gabber – it is unnecessary, rude, and ties up a repeater for others – go back to 80 if you must have "gallopping gums").

IX. Thou shalt watch thy deviation (some machines do only accept 5 kHz).

X. Thou shalt watch thy frequency (check your jap-track and clegg once a month *and* keep it working within a kHz or so).

There are many more, but these are the real problems – the ones that drive control stations "bananas"!!!

Ronald W. Perry WA2CGA
Trustee WR2ABB/W2CVT/WA2MRQ

Cont'd on p. 135

F.C.C. BOONDOGGLING

or

F.C.C.

where were you when we needed you?

Submitted by
W. H. Solfermoser KØDVI
1905 West Lake Street
Ft. Collins CO 80521

The following story contains my comments concerning my attempts, as the Trustee of the Northern Colorado Amateur Communications Association, Incorporated (NCACA), to obtain an amateur repeater license for NCACA in accordance with the newest Federal Communications Commission (FCC) Rules.

The NCACA was granted an amateur repeater license with the call letters WAØVVX on November 24, 1971. Operation of the repeater began on December 23, 1971.

In 1972 the FCC began promulgating new repeater rules as a result of the Docket 18803. Three definite deadlines were established by the FCC:

1. October 17, 1972 – date by which all existing repeater stations were required to meet the new rules' requirements to the best of their ability.
2. April 30, 1973 – date by which all existing repeater stations were required to submit new applications for new licenses in accordance with the new rules.
3. June 30, 1973 – date by which all existing repeater stations were required to go off the air if new licenses were not obtained. (This deadline has been extended.)

The NCACA submitted its application for a new repeater station license on April 27, 1973. The application described the existing operation of WAØVVX as modified to conform with the new FCC rules. It was the belief of the NCACA that the application outlined operation which was in full compliance with the letter, and the intent, of the FCC Rules.

The NCACA application was processed by, and rejected by, Mr. Robert Kite of the Washington FCC office.

The notes which accompanied the rejection led me to believe that the application may not have been studied in detail. Some questions asked by Mr. Kite were answered within the application. Some suggestions given by Mr. Kite for modifying the application appeared, to me, to be more nearly personal interpretations than official interpretations.

For example: Mr. Kite stated that amateur repeater Control Stations should be equipped to self-identify in Morse code at a speed of not less than twenty words per minute to make unauthorized determination of the Control Station's identity difficult. While I appreciate his concern for maintaining control link security, I find it necessary to make at least three observations:

1. The identity of a Control Station need not be as secure as the control coding of the Control Station. Anyone haviny the ability to listen on the control frequency might reasonably be expected to have the ability to employ fairly elementary recording-and-playback techniques to determine the content of Morse code at any transmitted speed. Also, it appears rather inconsistent to attempt to hide the identity of a Control Station when transmitting, but to require the posting of Control Station data at the repeater site.
2. The FCC Rules make no mention of such specific identification requirements. (Identification of amateur radio stations by amateurs has been with the intent of easy identification by the listener, historically.)
3. Although I have made a point of discussing the repeater application situation with every other amateur I have met, I have yet to find anyone who considered 20-wpm identification, who made that a part of his application, who was rejected because of his failure to include it.

Mr. Kite stated in his rejection notice that the NCACA had thirty days in which to re-submit the application without losing its place in the FCC queue.

The application was modified extensively in order to satisfy Mr. Kite's requests, item-by-item, and was mailed to the FCC on June 18, 1973 – within the thirty day period.

The NCACA, as an organization, and the Board of Directors, as individuals, have repeatedly expressed publicly their intent to operate NCACA stations in such a manner as to guarantee full compliance with the letter and spirit of the law, and to set an example of such operation to any amateur which might come into contact with NCACA. Therefore, after much discussion of the new repeater rules and the comments in the rejection notice, it was decided that we would rather shut down the repeater in view of a possible discrepancy in our interpretation of the FCC Rules and Mr. Kite's. It should be stated, however, that at no time have we believed that any of the actual, or proposed, operation of the WAØVVX repeater was in conflict with the FCC Rules' letter or intent or spirit.

With great reluctance, WAØVVX was removed from operation when the June 30, 1973 deadline arrived.

Knowing that the FCC was undoubtedly swamped with repeater applications, and having faith that the applications would be processed as expeditiously as possible, we remained off the air without bothering the FCC for quite some time.

On August 31, 1973 I called Mr. Kite. I told him I did not wish to seek special treatment, but that I wished to find out whether our application had been processed, or get an estimate as to when it might be processed. Mr. Kite informed me that he was no longer involved in processing the repeater applications; he had been loaned to that area only during the rushed period when our application had originally arrived.

Mr. Kite appeared to remember our application and stated that it would be processed "in due course" by Mr. Ferraro. He cautioned me that Mr. Ferraro would not be able to discuss it with me. He defined "due course" to mean approximately one to two months. He suggested that if I had not received any word concerning the application within that time period, it might be appropriate to call Mr. Ferraro at that time.

I told Mr. Kite that there was one other aspect of the NCACA application I was concerned about: two of the Control Station applications in the repeater system application were for licenses which expired during the month of August. I was told that the FCC Rules were explicit in stating that one may operate beyond the stated expiration date provided that "timely application for renewal had been made to the FCC" and that this requirement had been met.

Referring back to the repeater application, Mr. Kite did not wish to discuss any of the particulars of the application nor did he wish to discuss any of the points for which he had rejected it earlier. My impression was that he was relieved to be no longer involved with processing repeater applications.

After waiting several weeks, I called Mr. Ferraro on the morning of November 13, 1973. I told him that I did not wish to seek special treatment, but that I was becoming concerned that our application was lost and might, therefore, never get looked at. I also told him that my concern was deepened by the fact that we, as NCACA, had chosen to go off the air

Ed Note: Despite some glitches such as this, the FCC has managed to license some 1100 repeaters! Much bravo to Gary Hendrickson W3DTN, repeater operator, for joining the FCC and getting the work done.

rather than be, or even appear to be, in violation of the FCC Rules.

Mr. Ferraro agreed to look for the file. After several minutes he returned to the phone to state that he could not find the file. He suggested that perhaps I should re-submit an entirely new application since it was "probable that the application had been lost in the mails." I informed him that I had in my possession the postal receipt stating that the application had been received by the FCC on June 20, 1973. He then had me talk with Cathy Adams who is, apparently, a recording secretary. She agreed to look for the file, but came back to the phone later to say that she could not find it and that she would call later that day.

She did call late in the afternoon to say that she still could not find it; that she had the Gettysburg office looking for it also; that she would continue looking and would call me the next day.

Cathy called the next day (November 14, 1973) and said she had found it. She said she was not permitted to make an estimate as to when it might get looked at, but that I could talk with Mr. Ferraro about that.

Mr. Ferraro said he was not permitted to make estimates, but that it would surely be looked at during the month of November. I stressed again that we at NCACA were off the air waiting for a decision.

On December 27, 1973 I called Mr. Ferraro. He did not appear to recall having ever talked to me before. I read to him extensively from my notes made during the telephone talks of November 13th and 14th. He agreed to look for the application and to call me during the first week of 1974. No call was ever received.

In mid January 1974 delegates from the Colorado Council of Amateur Radio Clubs, Inc., on behalf of the more than twenty amateur radio clubs and repeater groups they represent, went to Washington, D.C. where they expressed their views concerning the incompetent actions of the FCC in regards to amateur radio repeater licensing.

The meeting lasted two hours. There was an ARRL representative present along with thirteen amateur representatives. Commissioners, Lee, Reed, Burch, Hooks, and Wiley were present as was most of the necessary FCC staff. Almost as in anticipation of this meeting the FCC had already released an order relaxing certain amateur repeater rules. This meeting seemed to bring about fast action for the Northern Colorado Amateur Communications Association, Inc. After almost eight months of waiting we received the call WRØADD.

However this was only a good start. Even though those certain repeater rules were relaxed our application was predicated on the more stringent interpretations of the FCC staff earlier.

As of August 1, 1974 NCACA is still trying to comply with the letter and spirit of the law before placing its repeater on the air. We haven't succeeded, yet!

Clyde E. Glass
Trustee, NCACA

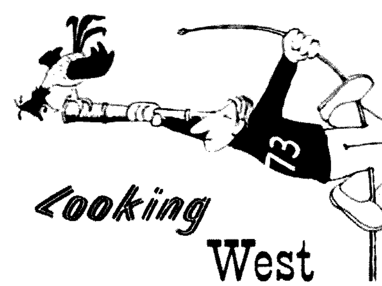
QSL CONTEST

DARC

D
A
1
M
K

B 11

Mike Kaul DA1MK wins the one year subscription this month with this striking woodcut of his home town, Nürnberg, Germany. Keep sending your entries to 73 Magazine, Peterborough, NH 03458.



Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA 91402

This is getting to be an expensive habit. Here I am again, "flying the friendly skies of United," heading West. I've been back in the "Big City" the past week and a half for a very special event. About 72 hours ago, my brother Bob and his new bride Rose vowed everlasting love to one another and began their married life together. This was one event that I could not miss, therefore, the trek 3,000 miles east. It was a beautiful wedding, but now I am heading back to the place where I belong. More important back to Sharon, the person whom I belong with. Its been a long week and a half, but a good one. More about the trip later, but for now, let's talk about the latest addition to the LA two meter FM scene; an open autopatch repeater.

Credit for WR6ACK must be given to its builder Doug Andrews K6VGH. Though ACK, which operates 147.93 in, 147.33 out was designed primarily to cover the West Los Angeles area, I have been told that stations as far away as San Diego have been able to make it into the machine. ACK is a split site operation with the receiver located atop Mar Vista Hill and the transmitter in Santa Monica atop the General Telephone Building. This combination seems to give good coverage to its prime intended coverage area. The autopatch facility is intended for general use with but two built-in restrictions. A "dial restrictor" limits the system to non-toll type calls and if you are long winded, thereby exceeding the three minute timer, your call will be terminated for you. The only other rule is the one that applies to all Amateur Autopatch Systems. Under no circumstances is the system to be used to conduct business of any type. In plain English that means its fine to make any kind of personal calls you wish, but calling your office for messages from your secretary is a strict no no!

In your editors opinion, WR6ACK is more than just another repeater, one having autopatch facility. I kind of view it as an experiment to see if such a system can survive in an urban

area the size of Los Angeles. If everyone shows cooperation and abides by the rules other such systems might eventually get put on the air. On the other hand, if the autopatch privilege is abused; if those that use the machine don't support it, it might have to go away. Putting an open autopatch on two meters is a big risk here in LA, but someone has to be first. My congratulations to Doug for being #1.

Mention "Star Trek" and you get more mail than you can hope to answer in a dog's age. That's what happened soon after the July column came out. No, I have no idea if Star Trek will ever be revived as a new series, but I wouldn't mind seeing it happen. From your letters I can assume I am not alone, but realistically, I seriously doubt if this will ever happen. Ah, but those re-runs were great till KCOP took them off the air. Must have seen each one fifty times or more. Gene Roddenbery and his staff were truly people ahead of their time.

KPFK's "Hour 25" on the other hand is "live and well" here in Los Angeles, every Friday evening at 11 PM Pacific time. Unfortunately, to those of you who asked, Hour 25 is heard only in the area covered by KPFK's 110,000 watt ERP signal, eminating from atop Mt. Wilson. (Remember that picture I ran some months ago of WR6ABE's new antenna installation? The antennas just below ABE's Stationmaster are those of KPFK.) This three hour program, conceived and produced by Mike Hodel who acts as co-host along with Cathy Calkin and John Henry Thong (Mitchell Harding's alter ego after passing through his Universal Rotator) is to my knowledge the only show of its type anywhere in the country; a program devoted exclusively to the world of Science Fiction or scifi (pronounced skif-fe). This is made possible by virtue of KPFK being a non-commercial, listener sponsored station thereby negating the need for commercials and the people that pay for them. There are no promo's heard during Hour 25 or any other KPFK program for that matter. No offense to the big three in broadcasting, but I prefer my programs that way.

On a typical evening with Hour 25 you might hear a live interview with such notables in the scifi world as Theodore Sturgon or Harlan Ellisson followed by open telephones so that the audience can take part in the interview process. This might be preceeded or followed by reports on scifi conventions throughout the country and the program usually concludes with a taped reading of a piece of scifi work. The open telephone technique is also used to permit the audience and the hosts to discuss just about any aspect of scifi that you can think of, that in itself is making for an interesting program. PS – That should have been "EQUICON" rather than ECLICON.

I found out about Hour 25 while interviewing Mike Hodel for a future 73 article I am writing on Pacifica Radio and freely admit that I have been hooked on it ever since. To those of you scifi buffs that might be here in LA some Friday evening and are tuning your FM broadcast radio around 90.7 when you hear some strange music followed by an eccoey voice saying "This is Hour 25, the science fiction – science fantasy program," stop tuning. You have just entered the world of Hour 25.

To my many friends in the metro-New York area, it was great to see so many of you and especially those of you at the LIMARC meeting. Though the evening was hot and humid, and this was my first time as a guest speaker anywhere. The people that make up the Long Island Mobil Amateur Radio Club were a fantastic audience and went out of their way to make me feel at ease. I sincerely hope that you enjoyed my presentation and films as much as I enjoyed presenting them. For me, it will be an evening to remember. Special thanks to Bob Reed WB2DIN and Lou Belsky K2VMR for handling all the arrangements, providing transportation and for that great corned beef on rye. One final and very special thank you to Myrt Billings W2BIV for some help of a type that only he could give. It was a good trip, but this 747 will be landing in a few minutes and I will be home. LA may be a great big freeway, but it's good to see the I-405 again.

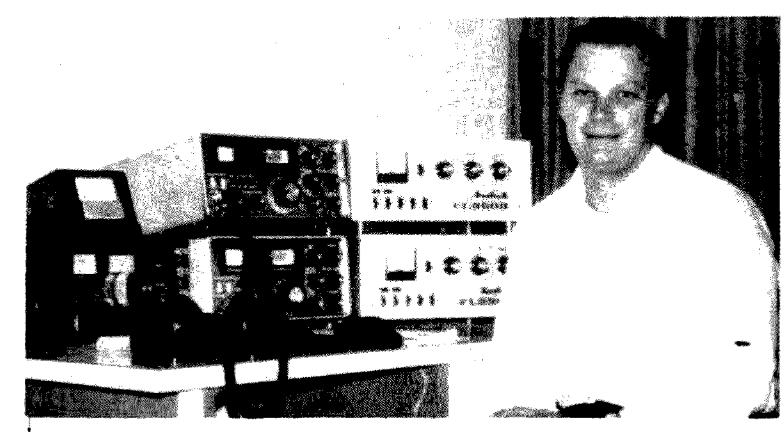
Finally, just as I was about to wind "LW" u for this month, I spoke with Capt. Dick McKay K6VGP and learned that he had submitted to the FCC a petition for rulemaking to permit fully automatic remote control over all repeaters. Needless to say, that this petition should it be adopted by the powers that be in Washington would be the kind of step in the right direction that is necessary to further stimulate the growth of repeater systems throughout the country. Therefore, we at LW fully support the work that Dick is doing on behalf of all amateurs and sincerely hope that the FCC will adopt his petition. Next month we will discuss this petition in greater detail. . . .WA2HVK/6

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

WB4OSN, who finally worked W7UBI, Idaho for state number 47, also mentions working TI2NA, TI2HL and TG9KJ. Joe says in part "TG9KJ has been putting in a nice signal running 10W into a 6 element at 85 feet. If you hear TI2NA's beacon, also look for Luis around 50.075. He is usually on CW and sometimes AM. QSLs for TG9KJ go to P.O. Box 115, Guatamala City, and don't forget an IRC or two."

Have had some correspondence with TI2NA which clears up the situation there. The beacon runs 40W to a dipole radiating North-South on a 24 hour basis. Erik originally intended listening on 50.250 but discovered no problem on 50.150. He says "I am sure you will get lots of reports that the beacon has been heard but my receiver on 50.150 fixed is not that sensitive and I have the problem that if the station is off frequency it is unintelligible but that will advise me that there is an opening." Erik also says "TI2HL (formerly OA4C) is in Costa Rica and active now on 50 MHz. His prime frequency is 50.110



TI2NA, the highlight of the 6 meter season. Erik works all bands from 160 through 432. You will most often find him on 50.150 or 28.600.

repeater update

Revision of Recently Published Repeater Atlas

INDIANA

WR9ACI	Anderson		6.22-6.82
WR9ADJ	Bloomington		6.04-6.64
WR9ABO	Evansville		52.920-52.575
K9OET	Ft. Wayne		6.31-6.91
WR9ADI	Ft. Wayne		6.16-6.76
WR9ACJ	Ft. Wayne		6.28-6.88
			449.8-444.9
WR9ACU	Indianapolis		6.28-6.88
WR9ACZ	Lafayette		6.16-6.76
WR9ACX	Marion		6.19-6.79
WR9AOD	Michigan City	T1.8	6.37-6.97
WR9ABO	Muncie		6.13-6.73
K9FAP	So. Bend		6.34-6.94
	So. Bend		7.99-7.39

IOWA

WRØAEH	Cedar Rapids	T2.0	6.16-6.76
WAØVWI	Cedar Rapids		7.00-7.60
WØLAC	Burlington		6.19-6.79
KØGVP	Creston		6.19-6.79
WRØAEB	Davenport		6.04-6.64
WRØ	Davenport		6.28-6.88
WØDYS	Marshaltown		6.28-6.88
WRØACF	Spencer		6.22-6.82

KANSAS

WØIPB	Hutchinson	6.22-6.82
WRØADH	Kansas City	6.13-6.73
WRØABT	Kansas City	6.19-6.79
WAØVVB	Kansas City	6.37-6.97
WRØ	Kansas City	7.93-7.33
WRØAEI	Kansas City	6.34-6.94
WRØABJ	Kansas City (RACES)	5.665-7.21
WRØABV	Kansas City	52.88-52.525
WRØACW	Norton	6.34-6.94
WRØACI	Plainsville	6.28-6.88

KENTUCKY

WR4AET	Paducah	6.16-6.76
WA4YZY	Pineville	6.22-6.82

LOUISIANA

WR5ACN	Alexandria	6.34-6.94
WR5	New Orleans	6.01-6.61
WB5FXF	Ruston	6.34-6.94

MAINE

WR1AOS	Mt. Buckfield	8.28-6.88

MARYLAND

WR3	Baltimore	7.84-7.24
WR3ABQ	Baltimore	6.07-8.67
		444.35-449.35
WRE	Cambridge	8.40-7.00
WR3ABL	Frederick	6.13-6.73
WR3ABM	Gaithersburg	8.04-8.64
WR3ABT	Hagerstown	6.34-6.84
WA3DZO	Harmans	6.16-6.76
		444.10-449.10
WA3SFJ	Havre de Grace	6.25-6.85
WR3ACL	Severna Park	6.10-6.70
WR3ACK	Silver Spring	448.00-449.00
		444.00-449.00
WR3ABW	Silver Spring	6.25-6.85
WA3BMM	Washington D.C.	53.25-52.68
WA3PVP	Wheaton	6.07-6.67
		223.30-224.30
		448.30-449.30
WA3BMM	Wheaton	53.25-52.68

MASSACHUSETTS

WR1ACP	Agawam	8.40-7.00
WR1ACB	Bellingham	7.86-7.06
W1UQ	Brookline	CLOSED
WR1AOC	Fall River	6.43-7.42
WR1ABI	Fall River	52.01-52.70
		6.19-6.79
WR1	Falmouth	6.25-6.85
WR1ABK	Foxboro	6.355-6.955
WR1ABZ	Holliston	53.64-53.04
		6.385-6.985
		442.00-447.20
		22.30-22.90
WR1ABX	Holyoke (Mt. Tom)	6.34-6.94
K1FFK	Mt. Greylock	6.31-6.91
WR1ADU	Mt. Lincoln	6.13-6.73
WA1KFZ	No. Adams	6.43-7.03
WR1ABW	Somerset	442.75-447.75
WR1ADC	Somerset	6.43-7.42
WR1	Springfield	6.16-6.76
WR1ABO	Worcester	6.37-6.97
		53.72-53.12

MICHIGAN

WR8AEC	Birmingham		CLOSED
WR8ADF	Clarkston		6.25-6.85
W8IQZ	Crystal Falls		52.76-52.525
WR8ABN	Detroit		449.00-444.00
WR8ACN	Grand Rapids PL	T2.15	6.16-6.76
WR8ADJ	Holland		6.28-6.88
WR8ABK	Jackson		6.16-6.76
WR8ABI	Kalamazoo		6.19-6.79
WB8CQM	Lansing		6.34-6.94
			6.22-6.28
WR8	Lansing		7.81-7.21
WB8CRQ	Ludington		6.34-6.94
WB8CRQ	Manistee		6.19-6.79
WR8AAA	Milford		6.19-6.79
WR8	Mount Clemens		6.07-6.67
WB8FNM	Mount Clemens		444.90-449.90
WB8BRA	Owosso		449.30-442.10
WR8ACS	Rochester		7.69-7.07
WR8	Sault Ste Marie		448.75-443.75
WR8	Traverse City		6.25-6.85
W8FGB	Trenary		6.16-6.76
WR8ACY	Whitmore Lake		6.07-6.67

MINNESOTA

WØGKD	Duluth		6.16-6.76
WRØACN	Faribault		6.19-6.79
W2NSD			7.75-7.15
WRØADP	Marshall		6.16-6.76
WRØADY	Minneapolis-St. Paul		6.25-6.85
WRØADT	Minneapolis-St. Paul		6.07-6.67
WRØAFG	Minneapolis	T1.8	7.75-7.15
WRØ	Minneapolis-St. Paul		6.16-6.76
WRØADM	Minneapolis-St. Paul		7.69-7.09
WBØBZC	Minneapolis-St. Paul		448.75-443.75

MISSISSIPPI

W5CSH	Crystal Spring	6.22-6.82
WR5ADC	Pascagoula	6.28-6.88
WR5	Vicksburg	6.34-6.94

MISSOURI

WRØ	Belton	7.72-7.12
WR7ADY	Billings	6.34-6.94
WRØ	Columbia	6.01-6.61
WRØ	House Springs	7.69-7.06
WRØ	Jefferson City	6.40-7.00
WRØABT	Kansas City	6.19-6.79
WRØAEI	Kansas City	6.34-6.84
WAØVVB	Kansas City	6.37-8.97
WRØABJ	Kansas City (RACES)	5.665-7.21
WRØABV	Kansas City	52.88-52.525
WRØ	Kansas City	7.93-7.33
WRØACC	St. Louis	52.25-52.80
WRØADV	St. Louis	6.07-6.67
WRØADB	St. Louis	444.50-449.50
WØEEE	Holla	6.28-6.88

MONTANA

WR7AOY	Billings	6.34-6.94
WR7ADN	Bozeman	6.28-6.88
WR7ABY	Butte-Anaconda	6.34-6.94
WA7OAA	Great Falls	6.280-6.880
WA7KZZ	Helena	6.16-6.76
WA7KZM	Missoula	6.16-6.76
WR7AOO	Sweetgrass	6.34-6.94

NEBRASKA

WRØACZ	Scottsbluff	6.34-6.94
WRØAEA	Columbus	6.04-6.64

NEVADA

WR7ABB	Las Vegas	7.18-7.84
WR7ABI	Reno	6.34-6.94
		6.34-7.48
		6.94-7.48

NEW HAMPSHIRE

WR1ABU	Concord	6.34-6.94
		444.55-449.55
		53.68-53.08

NEW JERSEY

W2FLY	Camden	6.22-6.82
WR2AOO	Cherryville	7.975-7.375
WR2ADB	Denville	6.385-6.395
WR2ABM	Fords	447.40-449.40
		6.22-8.82
W2SJT	Harmony	6.22-6.82
WR2ADO	Montclair	7.945-7.345
WR2ADV	Paramus PL	6.19-6.79
		448.10-443.10
WR2AOQ	Ridgewood	448.55-443.55
WR2ADJ	Sayreville	6.16-6.76
WR2AEE	Somerville	7.855-7.255
WR2ADE	Trenton	6.07-6.67
WR2ACY	Whippany	7.63-7.03
WR2	Woodcliff	6.355-6.955
		6.19-6.79

MORE NEXT MONTH

Send any and all corrections, updates or new listings to 73 Magazine, Peterborough NH 03458.

and sometimes he runs his own beacon." Erik lists a number of stations worked including WB4PXW, W2REB, WA4EFB, W3BWU, K2ZYX, W5WAX, K8MMM, K7PXI, XE1GE and KØHHB.

SMIRK had 466 members in 44 states as of August 1st. Membership applications should be sent to Ray Clark, K5ZMS/5, 7158 Stone Fence Drive, San Antonio 78227. Ray says he heard TG9KJ on CW the 9th of July, XE1GE and XE1FE also CW on the 10th and passes along that Joe WA5HNK heard LU3EX on CW the 12th. 'Bert, K5HVC told me he heard an Anchorage, Alaska butane gas company testing their transmitter at 0230 this morning (July 26th) on 49.955 for about 35 minutes." Ray says JA1RJU has sent in his membership application, Kazuo is editor of Japans "CQ Ham Radio" magazine.

The (Indiana) 6-6 Club is now at 126 members and still growing rapidly. The first gold star for working 25 members went to WA9MEM. Congrats Mike!

Did you work WØNRI/Ø/7 on the Wyoming/South Dakota line during the June contest? The many who did appreciate the effort expended in getting the camper properly positioned.

The East Coast VHF SSB Net meets at 1500 CUT Sunday on 50.175. Ray K2EGH is net control for this fine group.

WA1EXN worked TI2NA on July 2nd, and enjoyed every second of it.

On several occasions I have been requested to mention the desire of one group or another to make schedules for a particular contest or activity. I am more than willing to do this if the information is received early enough. The most recent request is typical of the problem. The request was mailed July 25th, the deadline of the next column was August 10th. This column was for the October issue, which is distributed in late September. Unfortunately the contest in question will have been completed two weeks before publication. Please allow enough lead time on requests of this sort.

WAØABI

SSTV SCENE

Dave Ingram K4TWJ
Rte. 11, Box 499, Eastwood Vil. 50N
Birmingham AL 35210

The enjoyment in seeing pictures of the fellow operators you contact, their family, rigs, even pet projects slowly unfolding down an SSTV monitor screen is rather difficult to describe. SSTV permits QSOs to be more like an actual visit than just a quick chat. What do you do when you visit one of the local gang. . .look over the rig, start discussing new ideas and draw up some sketches or, if it's electronic, maybe block diagrams or schematics for mutual discussion? Sure. . .it's just typical "ham" nature. What better reason could we have for SSTV! Slow scanners naturally become a rather close knit group because they have an additional means to really learn about each other. During picture transmissions a Slow Scanner might reveal his interest in, say, vintage automobile restoration, only to find one or two of his viewers also automobile enthusiasts. Following QSOs would naturally lead to the "look what we ran across when. . ." bit followed by pictures and ideas many magazines would relish.

Slow Scan TV reminds one tremendously of early ham radio days when operators built and tried practically anything reasonable. Further, these early ham operators seemed to all know each other personally because of the common "wireless" link and the time they took to actually communicate with each other. Why should we, in this modern age, contact someone thousands of miles away and then stare inadvertently at the receiver dial or speaker trying to visualize them? Just as commercial TV filled the void of early radio programs, SSTV can fill the void of audio only QSOs. Today's SSTV operators are modern day pioneers who want to share their enthusiasm. Slow Scan TV is a wide open field of tremendous fun, where major advancements are still being made on an individual basis. (Manufacturers are having difficulty keeping up with us!) Why not join in the excitement. It is, indeed, amazing to see pictures of a beautiful sunset across Africa's plains from ZS3B, a live volcano from Z2AAV or a Tasmanian Devil from VK5BS one night and Israeli IDs, some beautiful girls or even schematics of new circuits the next night.

No longer must amateurs be concerned with only their voice; now they must watch their looks! Your physique is on the air, old boy! "Is that a beard you're growing, or just poor lighting?" "Hey – didn't you forget a neat shirt?" "Look at my new linear!" That's just part of the exciting new world of Slow Scan TV.

If you're not into SSTV now (. . .maybe you're looking over this column out of curiosity) why not make it a point to visit one of the SSTVers in your area and judge for yourself? If you are an active SSTVer, why not offer to give a SSTV demonstration for your local club. Either way, I'm sure the results will be gratifying. Should you be interested in homebrewing a simple SSTV viewing adapter with a minimum of cash outlay, consider the oscilliscope viewing adapter described in June, 1970 QST. It makes an ideal "Beginning SSTV" project.

Hams are not the only ones finding SSTV a useful communications tool. Schools and hospitals are now considering it as a mass instructional means. One of the more popular methods is to lease an FM stereo station's subcarrier for transmitting the SSTV, then to use a subcarrier receiver "in front" of a SSTV monitor (or scan converter) for reception. As I mentioned a few months back, commercial scan converters are still using scan converter tubes, and prices are quite high. Commercial MOS Shift Register type scan converters are presently not economically feasible. Police departments are also finding SSTV very useful. Using SSTV, positive identification of a suspect can be made from a patrol car before arrest thus preventing any possible countersuit due to mistaken identity. Gee, before long police cars may be a rolling SSTV studio! I suspect a snap on camera adapter would be advantageous for daytime use, or "mugshots" dispatched to units. However, SSTV is still less expensive than faxsimile units some cities considered using.

This month's SSTV picture is compliments of George WB9LVI, and points up a slogan that's growing in popularity. The picture was scan converted from Slow to Fast using his digital converter, which does quite a good job. If it seems like I'm pushing this month to get others interested in SSTV, you're right. We SSTVers have a grand thing going. Remember, newcomers are vital to the growth of Slow Scan, and the more there are the more we all have to share.

The WØLMD Fast to Slow Scan converter described in last month's 73 is destined to be a SSTV classic. This is the "black box" unit that connects to any regular Fast Scan camera (like those inexpensive closed circuit jobs) and outputs with SSTV. No modification to the camera is required. . .just plug it in and go. No doubt this unit will prove a real advantage to SSTVers. Possibly your magazine store still has a copy, in case you missed it. If not, you can order it directly from 73 Magazine, Peterborough NH 03458, for $1.

Here's a thought you might keep in mind for future reference on the complimentary transistors used in electromagnetic deflection circuits. In a bind, try 2N697s for the NPN and SK3020s for the PNP. If current requirements are exceptionally high

you can always parallel two of either type. As the scanning frequencies are low, we can pull quite a few short cuts like this.

Recently, Harry Mills K4HU, furnished us some very interesting information on the early scanning disc TV system I mentioned in last month's column. Harry, who during the late 20's was an engineer with RCA, told of receiving these pictures rather well. They were transmitted by WGY in Schenectady NY on the broadcast band. WGY would conclude radio programming at midnight and then transmit TV from about 12:30 – 1:00AM. An early "crater" tube, manufactured by Daven Co., coupled with a metal scanning disc approximately 41cm (16") in diameter gave 5.08cm (2") pictures. Fantastic! The only complaints I've heard is by the time you had adjusted the disc speed to sync, there was little time left to view pictures. I'm sure you can compare this to those first SSTV QSOs, which seemed so short, and you kept staring at the monitor afterwards, watching those pictures slowly decay. Incidentally, I am presently completing construction of a scanning disc transmitter, monitor and receiver, and applying for special permission to transmit these pictures on 80 and 20m. (1975 is the 50th Centennial of TV.) If all succeeds, I will have a full story, along with a very simple and inexpensive converter, plus a cutout for the actual disc to use here in 73. If it sounds like fun, drop me a card now. I need all the support possible for assured success. K4TWJ

DX FOOTNOTES

By: Gus M. Browning, W4BPD
Drawer "DX"
Cordova, SC 29039

Looks like all the big conventions for this year are about through with. I did get to go to two of them, one in Jacksonville, Florida and the other over in Atlanta, Georgia. Both were well attended and looked very successful. I noticed that Transistors, ICs, printed circuit boards and all the new small size communication tools are getting more plentiful all the time. The big heavy stuff is not there like it used to be. If you are not "in there" starting to get your feet wet with these new "tools" of ham radio, you had better soon start or you will be left by the wayside. As for myself, I had been fooling around mostly with IC dividers, and the various gates, etc. Finally, last week, I bought three of these little Phase Lock Loops to fool with. I only wish I had more time to devote to this side of ham radio.

I hope all of you worked the boys on Kingmans Reef, due to a number of difficulties they did not get to stay there as long as they had planned, and they didn't get on the low-bands. I suppose this still leaves this Brand New DXCC on the "most wanted rare country" list for many fellows and it would not surprise me if someone goes back there again within the next year or so. We all hope they can stay long enough to remove the reef from the "rare" list for a while. But, keep in mind that even a country with one fairly active ham stays on the rare list for a lot more people than one with a 24 hour, round the clock operation that lasts for three or four days by a DXpedition. DXpeditions usually send out QSL cards pronto for all their contacts or at least to the fellows who send them a card. This is not true 100% of the time with fellows who have a whole country to themselves.

I have been reading about the upcoming frequency allocation meeting and the possibility we could end up with a couple new bands, perhaps get a few more kilocycles on some of the bands we now have and that we may lose a little on a UHF band. Except for that last item, the whole thing sounds pretty good and I hope we will have a lot more "gains" than "losses" when the meeting is through. That will be the time for that "log periodic" antenna that covers a whole flock of frequencies. I don't know of any antenna that can do that, unless it's a sort of multiple, long wire deal, one with many lobes in many different directions. Maybe some smart fellow will come up with a brand new antenna type. Anyhow, let's QRX and see what the outcome of the frequency allocation conference is and let's all hope for the best.

They say the sunspots are still getting lower and lower in number, and no one seems to really know when they will hit the bottom. The fellows are still working plenty of good DX; I guess they must work it fast when openings are short, or else there are more openings than the sunspots would indicate there should be.

Something that would interest every DXer would be a serious study of some of the very excellent DX QTHs of some of the DXers who so consistantly put out signals that are so much louder than other stations in the same general area. I have in mind such stations as W3CRA, W9ADN, exW4FU (the old original QTH), and a few others. These fellows put a consistantly louder signal into the far corners of the world than the average first class station. I so well remember that S7 signal from W3CRA over in the Indian Ocean and up in the AC spots when no other USA station was even being heard. I know most of them personally, they don't run any "big stuff" at all nor do any of them have up any super antennas. Something in the "lay of the land" or something under the ground does the trick. It would be very interesting to really know what causes those loud signals when the band is very poor for other DXers. It definitely is not high power, IT IS THE QTH and nothing else that does the trick.

I have had here as a visitor Jake Ritzen CT2AZ, WØJHY for the past couple of months. Jake came in here like a ball of fire and he is still a ball of fire! He has taken upon himself filing things where they belong, answering all inquiries the day they are received, filling the Coke machine, sweeping the floors, running up town, delivering and picking up, cleaning out the car, cleaning up the yard, keeping the grandchildren from the print shop and going out to a farm to pick various vegetables from the farmer (at very good prices). He just keeps on going all the time and so far has not slowed down at all. By the time this is in print he probably will be working up at a calculator manufacturing plant in Lexington, South Carolina. I am sure Peggy and I will miss him and all the FB work he has been doing around this establishment. Jake is one of these fellows who can't set still and twiddle his thumbs!

There is talk about fellows going to Aden, Iraq, Clipperton and other rare spots. I would suggest that if any of you need these three, that you keep your ears glued to the bands or subscribe to the 73 Magazine, "Hotline" or my DXers Magazine. AP2KS is trying for Burma, too. Let's all hope every one of them is successful in their plans and wishes. Seems like the bands more or less open automatically when a real active DXpedition is in the rare country. I guess there are a lot more openings than the sunspot count would indicate. Of course, the serious DXer will stick in there with a S-1 or S-2 signal and work the fellows.

Some of the DX that has been worked in the past few months: A51PN (Bhutan), FO8DY (French Polynesia, FR7ZL/T-Tromelin (hope they get his card), FK8BB-New Caledonia, JT1AT-Mongolia, KP6KR, Kingman Reef, KP6AL-Palmyra Island, KP6PA-same spot, TL8ET-Central African Republic, TN8BK-Congo Republic, 3D2FC-Fiji Islands,

9X5PT-Rwanda, A35FX-Tonga Island, BV2A-Formosa, CN8BO-Morocco, C-21DX-Nauru Island, HKØBKX-San Andres, S-2-Bengladesh (SM2DWH/S2), VK9NI-Norfolk Island, K9KGA/6W8-Senegal Rep., HR6SWA-Swan Island, KA6WT-Ryukyu Islands, TA2BK-Turkey, TA2SC-Turkey, VU2GDG-India, VE6JL/SU-Egypt, 9N1CK-Nepal, 9M2GV-West Malaysia and quite a few other DX stations. All these are so called "poor" conditions. Should be interesting to see what DX will be worked when conditions are again "good!"

DX QSL Info:

HR6SWA QSLs to H.W.S., Swan Island, P.O. Box 120, Grand Cayman, B.W.I.

KA6WT-(his home call is W4TAL) QSLs after September to his home call QTH.

VU2GDG via Box 1480, Coimbatore, India.

ZF1AL to WA4SVH.

9M2GV via K6LAD

VK9YU-VK6SW (I am not 100% sure of this, but I think it's o.k.)

A35FX via ZL2AFZ

VE6JL/SU-Via the VE6 bureau.

A51PN via W1JFL

FO8DY via Box 85, Papeete, French Polynesia

FK8BB via DJ9ZB.

JT1AT via P.O. Box 639, Ulan Bator, Mongolia

KP6KR via W6WX or NCDXF-P.O. Box 717, Oakland CA 94604

3D2FC-Via Box 1250, Suva, Fiji Islands.

DX DUE TO COME UP (at time of this writing)

VP8 (LU?) A group of hams from the Radio Club of Argentine is planning a DXpedition to SOUTH SANDWICH Islands. Plus a group from the West Coast (not sure of which West Coast DX Club they refer to), probably NCDXF group. Their plans are to be on South Sandwich either in November 1974 or January 1975. This will be a 4 day operation with all bands and modes being used; even will try to work the fellows in the Novice portions of the bands. They say that no certain group of fellows will be "favored," meaning I suppose that they will get stations all over the bands. 14275 up, etc. You had better make your plans to get this one, fellows, because it will cost plenty of money and probably will not be repeated again very soon. Getting to countries below the Ice Pack is big trouble, big boats and big money! I so well remember my trip to Bouvet Island.

SV1GA/A Mt. Athos – should have been on and finished by the date you read this. The trip is planned by those old faithfuls OH2BH, OH2MM and SV1GA. I would suppose the cards should go to Martin-OH2BH.

C21DX by JA1OCA, HBØ Late July, early August by DA1QC, HC2YL is Darlene fellows, HC2TV plans for some low frequency operation in October, will be trying for 5BDXCC while there and even some 160 meter operation.

Pacific DX net meets regularly at 0600z on 14265. If you are not a net member please wait until they call for non-members to check in. They generally have a few good ones checking in, and you might be lucky and get the one you need.

VK9YU, Cocoa Keeling plans to be active up until about October 1st (more or less).

During the QRP tests from the Pacific with W6WX using only 1 to 2 watts a good, usable signal was being heard in W4-land on 14100 kc 0400 to 0600 GMT. This was W6WX/MM in July while on the Kingman Reef trip with the other fellows.

VK2BKE/LH is now active and plans to be there for ONE YEAR. Was worked on 14265 kHz around 0600z.

BV2A has been working them on CW and by now should be on SSB. This is Frank, W9ZNY. When you hear HR6SWA you are hearing exKS4 land (Swan Island). They now only count for HR land now (except WTW still counts them as Swan Island). It has been suggested to me, by quite a number of DXers, that a rare DX station who is stuck with a transceive situation should go the "MC" route. It seems that when strictly transceive is used the situation slowly gets out of hand, then no one can hear the DX station because someone is ALWAYS CALLING. I listened to quite a mess when VE6JL/SU was on transceive and the fellows started the "chain-calling," when one stopped another started and this went on for quite a while. When they all finally came up for "air" the station in Egypt had just QUIT (and I don't blame him either!). It's a shame about things like this. Even the district by district of working the boys did not work out because too many fellows called out of order. W9DH tells me that the control was all shot by the time he got to W9. I guess the MC route is better under these conditions.

LETTER TO EDITOR R.E. DXCC, et al

Dear Gus

There seems to be a lot of controversy lately on what constitutes a "country," so here's my suggestion on how to please (almost) everyone. Although I'm not particularly a "certificate chaser" let's also realize that the more awards available, the more DX activity we stir up (WAS for example). Therefore, why not have an award for all DXers, regardless of their difinition of "country."

AWARD NUMBER ONE: for the purist – this award would be for working "political countries." KH6 would be USA, Latvia would be USSR, Ceylon would be Ceylon, Mt. Athos would be Greece, etc. The U.N. or I.T. UIARU would be naturals for sponsors.

AWARD NUMBER TWO: For the Political Scientist – include Colonies and Dependencies as separate countries, but exclude the islands reefs, or anything which can't be classified as a political or a colony thereof. This admittedly is a weak definition (ambiguous) but someone should be able to put it on paper properly.

AWARD NUMBER THREE: For the guy who resists change – Present DXCC country list.

AWARD NUMBER FOUR: For the DX Hound/Geographer. Include all countries, colonies, islands, reefs, dissenting autoomies, etc. All Canadian, USSR, Papanese, etc., provinces, the fifty states, and anything which can be found to have any basis for separate listing should be included even separate the 5 Hawaiian Islands.

This way, you could pick the award that matched your definition of "country" and the award chasers would have 3 new ones to work for. And it certainly would not decrease DX activity or demand for W/K types.

...WAØTAS

What do you think of this, fellows? Looks like Award number four fits our soon to come out Super WTW. None exactly fits our present WTW though – since we call our 'countries' all that's listed on DXCC, REF, DARC, WAP, etc., lists. In fact I still say, there must be a better word to use than "country" in our DX language. How about some of you fellows who know of a better word making a few suggestions to me?

When someone asks you how many countries you have worked and you say 300, they usually ask, "Are there 300 countries in the world?" About that time you try to change the subject to something else because you just cannot explain to anyone that Geyser Reef, Blenheim Reef or Kingman Reef and other similar places are "countries." Seems to me if such places are being called countries that ALL ISLANDS should be called the same thing. There I have said my 2¢ worth again, not that anyone is going to pay me the least attention!

The hook is clean here for this month fellows. How about some of you out there sending me a lot of

good DX info for this page? I am sure a little publicity would not hurt anyone. We will of course mention your call as the source of the DX info you send to me. 73 till next month.

73 es DX,

de, Gus BPD

GOING FIRST CLASS !

Using the EBC-144 Jr. 2m Transceiver

Synthesis, with no limitations, is the name of the game with the new Emergency Beacon transceiver. For the first time we were able to dial up even the most oddball of repeaters.

The ads for the Emergency Beacon "Dream Machine" transceiver – a rig which could obviously do everything, including scanning, total synthesis, tone burst, continuous tone, Touchtone, 600 kHz splits, 990 kHz splits, one meg splits, simplex – and you name it – the ads for this rig got a lot of fellows all excited, nervously putting away money now and then in case they talked themselves into getting one.

Unfortunately, as with most pieces of really sophisticated equipment, the delivery on some of the special parts required to put the rig into production stretched on maddeningly and the boys at Emergency Beacon decided to proceed with their secondary project, a junior model of the Dream. This is the EBC-144 Jr and it has all of the basic functions of the big rig such as synthesis down to 5 kHz steps, a priority channel scanning system, 600 kHz high or low split automatically for repeater operation, provision for connecting a scanner, and things like that.

The fellows at EBC were not only having problems getting the zillions of parts needed for the big unit, but they also found that while bread and milk had inched up only 25 to 50%, the prices on parts had in many cases doubled and tripled! This brought the price of the big rig from about $1000 to $1500, with many signs that even this stiff price might have to be increased substantially. The customers who placed their orders at the early price had indeed gotten in on a very good thing.

The Junior has been priced at $599 for starters. We'll be greatly surprised if this doesn't go up before long. And considering what the rig does, even at $600 this has got to be one of the best bargains in ham gear on the market today.

Ohe of the first moves we made with the Junior was to mount it in the 73-mobile and head for the top of the local mountain to see how it would do up there in the high density rf that prevails. We checked it out on every repeater we could reach – and we can reach a bunch from up there. All we had to do was set up the "A" channel on the repeater output and switch to "Auto" on the mode switch and we were right in there.

While not too many rigs can weather the rf storm on top of the mountain without intermod and other garbage, the Junior was absolutely quiet. Even the several local commercial repeaters didn't break through! And they put out a lot of microvolts. Next we started checking out the splinter repeaters to see how the Junior could handle the 15 kHz spacing – particularly when the repeater was right in the next channel to a strong and oft used repeater. For instance we checked into WR1ACL in Salem NH which is set up on 147.165, right between WR1ABB in Framingham (Mass) on 147.15 and WR1ADF in Bridgewater (Mass) on 147.18, both of which are pretty active. Oh, we could hear some crosstalk, but it wasn't enough to hurt anything. It proved that it is possible to build a receiver which can handle the 15 kHz splits. Both ADF and ABB pinned the meter, which ACL was only about half way up at S-6.

Next we dialed up WR1ADC in Somerset (Mass), a 990 kHz repeater with input on 146.43 and output on 147.42. No strain with the Junior – just set the mode on "Split" and put the receive channel on "A" and the transmit channel on "B" dials, and kerchunk, there was ADC, loud and clear.

Aha, what about that private closed repeater in Manchester NH, the one with the secret input channel? We knew their input had been around 145.88 or so in the past and the output on 147.33 so we set up the rig to listen on 147.33 and, sure enough, there was the repeater with someone talking away. We quickly dialed up 145.88 and moved up and down, centering on 145.89, listening to the repeater input. Next we set up "A" on 145.89 and "B" on 147.33 in the Split mode and broke in with a short "Hello." It worked! "Who was that who broke in and said hello?" We gave our call and they promptly turned off the repeater. They do that to anyone who calls in who is not a member of their small closed group. There may be more unfriendly repeaters in the country, but word has not reached us about them. This is most distressing to the rest of the New Hampshire amateurs, who are rather proud of the warm and friendly reception they give visitors on the other New Hampshire machines – and there are a bunch of them.

Just to bolster our confidence in 2m FM and be reassured that the reception on WA1KFV was highly unusual, we checked into WR1ABQ on 25-85 in Derry NH, WR1ABU in Concord NH, WR1ACQ in Deerfield NH, WR1ACN in Londonderry NH, WR1ABF in Salem NH, and WR1ADX in Wolfeboro NH. All were outstandingly nice.

The reports on the rig were most complimentary – not only was it right on channel, but the audio was superb.

True to the "Never Say Die" motto which is more than a catchword at 73, we set up the rig to work on channel "A" and listen in with priority on channel "B" on 147.33 so we could hear KFV when they turned it back on again. After a while someone did tone it on and we knew it immediately for the Junior works fine on

channel A, but every few seconds it flips briefly to B to see what is doing there and then back to A again. That little function keeps you from missing anything. Fortunately cooler heads prevailed and nothing was done to further invade the privacy of the KFV group, despite some of the inflammatory remarks that were being passed.

In most cases where a repeater suffers jamming and heavy kerchunking, you'll find that there are some good reasons why this repeater has been singled out for harrassment. The KFV group is certainly asking for it, but since few ops have synthesizers as yet – particularly synthesizers which will cover the entire band and go down below 146.0, they've been relatively free of troubles. The Junior covers from 143.5 to 148.5, thus making it simple to get into all of these weirdo repeaters as well as MARS and even CAP repeaters which are just outside of the 2m band.

In the Automatic mode the rig transmits 600 kHz lower than the received channel within the 146 MHz segment and transmits 600 kHz higher in the 147 MHz segment, per the standard used just about everywhere in the country now. Some of the repeaters on 147.00 MHz have their input on 146.40, so you have to turn the mode switch to reverse for this. There are a few repeaters in the 147 segment which have input low and this will solve that problem too. Band openings and inversions drive these non-standard repeaters batty as they lock up on other repeaters sharing their channels, but with reversed input/outputs.

The Junior has a big plus in the back which mates with the EBC scanner and turns your receiver into a six channel scanning receiver. More about that extra option when we have a chance to check it out at length.

The transmitter is rated at 20 watts output, but the Bird Wattmeter indicated close to 25 watts on our unit. You don't really need an amplifier much when you're starting out with that amount of power.

The Junior has a built in speaker, like most 2m rigs (but not all), plus a jack in the back for an external speaker (we prefer to use the external speaker in the car which is mounted where it can easily be heard).

While there is not a lot of activity in New England below 146 MHz, with the exception of Oscar and a couple of repeaters which still have inputs below 146 (WA1KFV and WR1ACY in Glastonbury CT 145.47-147.09), it is nice to be able to tune down and actually hear what is going on in the rest of the band. The Auto function on the mode switch cuts out below 146 and the rig is simplex in that part of the band automatically. You'll find that the AM boys, what few there are left of them, will generally be able to copy your FM signals if you feel like calling them. If the FCC ever does open up more of the 2m band to repeaters, as many ops are beginning to think they should, the Junior will be able to cover the new band for you right off.

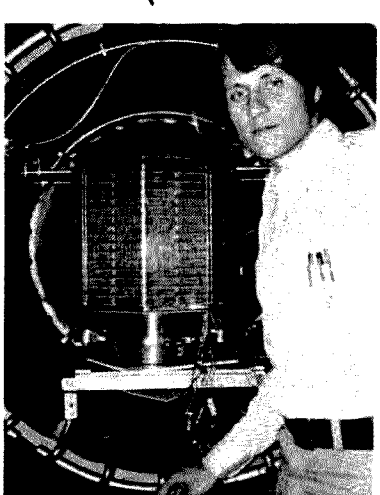
The receiver sensitivity was everything we could ask – the size perfect – the flexibility fantastic. Two meter rigs have certainly come a long, long way in the last couple years! When you consider the savings on crystals, even the cost of the synthesized rigs is not out of line. The Standard 1400 rig that we used for a couple of years required 44 crystals – at $4 each that came to $176 in crystals alone! Even if you've been managing to get along with a 12-channel rig, that's $96 investment in crystals.

One has to face up to a simple philosophical question – are you going to be satisfied to stick with one or two repeaters or are you the type of person who wants to be able to use all repeaters – who wants to have a rig that can be taken anywhere and put you in touch with what is happening? A lot of 2m ops get on one repeater and never go anywhere else. Presumably they are happy, so there is a chance that you can get along with this limitation and don't need a synthesized rig. We feel you'll miss a lot this way.

AMSAT NEWS

OSCAR 6

Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429



Jan King W3GEY, A-O-B Project Manager installing A-O-B in Thermal Vacuum for testing.

AMSAT-OSCAR 7 is scheduled to be launched from Vandenburg Air Force Base in California on October 10, 1974, sometime between 1600-1700 GMT. W6AB will broadcast the countdown on twenty meters. AMSAT members will be on the air most of the day, two frequencies to monitor will be 14,280 kHz, and 3850 kHz.

AMATEUR SATELLITE MATCHING FUNDS

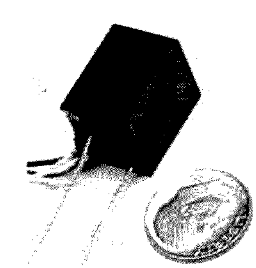
William Eitel WA7LRU/W6UF and Herbert Hoover, III W6APW, have generously offered to match, dollar-for-dollar up to a total of $25,000, donations to the ARRL Foundation earmarked for use in the amateur satellite program.

Funds are urgently needed to support the construction of AMSAT-OSCAR 8, which is estimated will cost on the order of $100,000.

We urge you to support the amateur satellite program with a financial contribution. Contributions to the ARRL Foundation are tax deductible under Section 170 of the Internal Revenue Code.

Thank you for your support!

NEW PRODUCTS

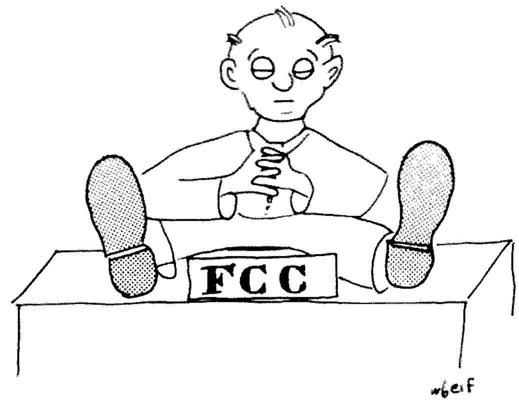


Looking for a SUBAUDIBLE TONE GENERATOR for your small hand held or portable FM radio? 'THE CUBE" is only 1.27cm x 1.52cm x 1.78cm (.5' x .6" x .7") in physical size, but it has a whopping sine wave signal out. Designed to be used with any of the subaudible guarded systems, it works on 9-16V and has no moving parts. It can be set on any frequency between 98 and 240Hz with a trim resistor. THE CUBE is available from RGS Electronics at the low price of $19.95. For an extra $5.00, it can be set on frequency by the factory. Contact: *RGS Electronics, 3650 Charles Street, Suite K, Santa Clara CA 95050.*

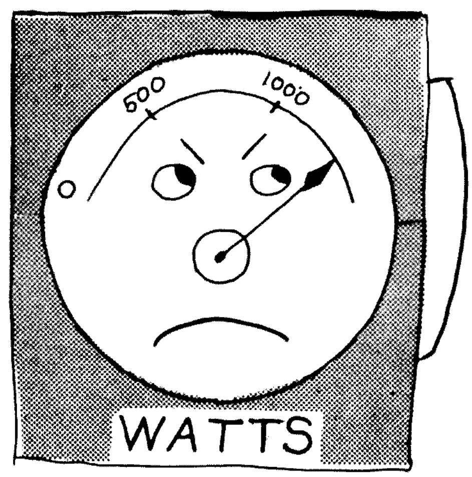
News cont'd on page 131

H.T. Orr W6EIF
249 Juanita Way
Placentia CA 92670

The FCC as seen by ....



The Irate Neighbor with TVI

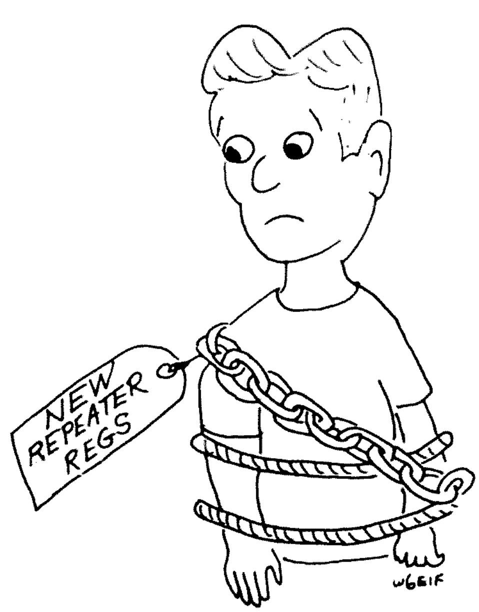


The California DX'er

The ARRL

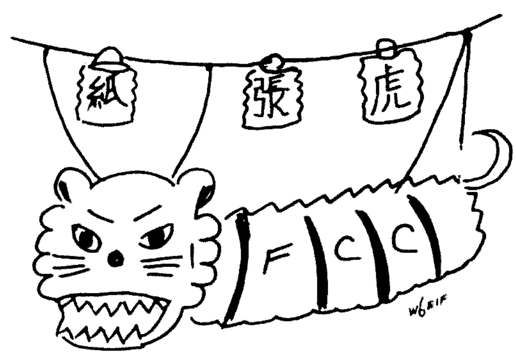
The Novice

The Canadian Ham



The FM'er

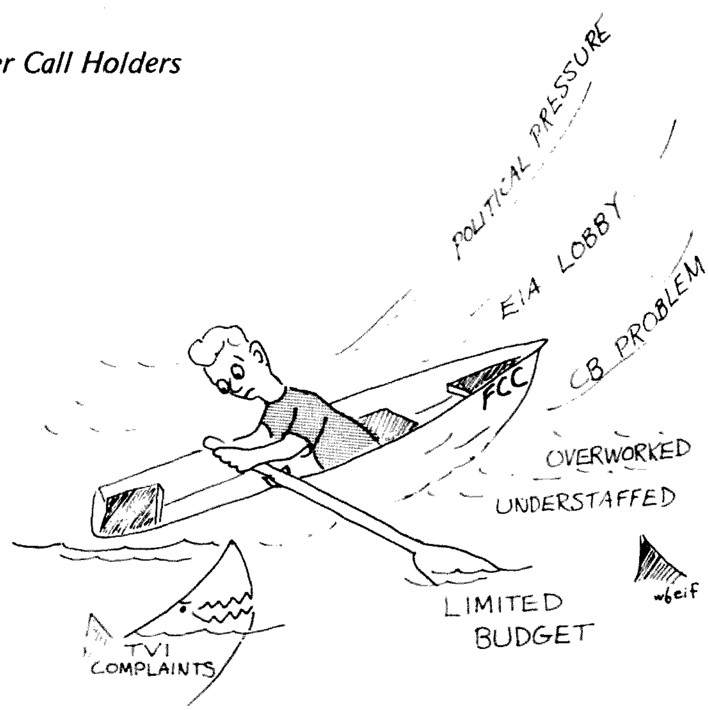
The New Two-Letter Call Holders



The CB'er

(The Chinese characters mean "Paper Tiger")

The FCC Itself



Bill Hoisington K1CLL
c/o 73 Magazine
Peterborough NH 03458

Introduction to "MICROTRANSISTORS"

Just how small can the homebrewer make an amateur rig – with reasonable-cost parts – that works well enough to get, say, 50 miles on 6 meters?

General Electric makes a line of microtransistors called "Microtabs," and in this line are some nice ones that will oscillate at frequencies as high as 1 GHz. And Bill Ashby of KMC Semiconductors makes some that go to 2 GHz.

Figure 1 shows a sketch of the approximate shape and size of these little molecular firecrackers. Now don't get the idea that just because they're tiny that you can't work out with them. Lots of things come to mind, such as 2 meter FM units suitable for repeater operation, and a host of other such devices.

As usual, with a reduction in size of an order of magnitude in one component, you have trouble getting the other parts down in size proportionately. We will deal with some of the components that are available today for the amateur homebrewer for making pocket-size rigs, and cover some circuits and modules that can be combined into such rigs.

As you will see even when you build a Dick Tracy rig that fits on your wrist, you'll still have to think about a microphone, speaker, and an antenna. Also, the average amateur does not have a good 10X stereo microscope on hand to work with. Nor does he have micromanipulators or any of the other devices commonly used for microminiature packaging applications, either.

Then there is the cost question. For the military or certain specialized commercial interests, where money is not the prime consideration, paper batteries, thin-film circuitry, etc., can be ordered to suit. However, there are certain things in this line that amateurs can do, and with a little prodding of suppliers of tiny components (reminding them, perhaps, of the large

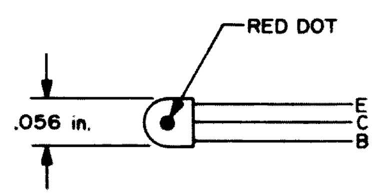
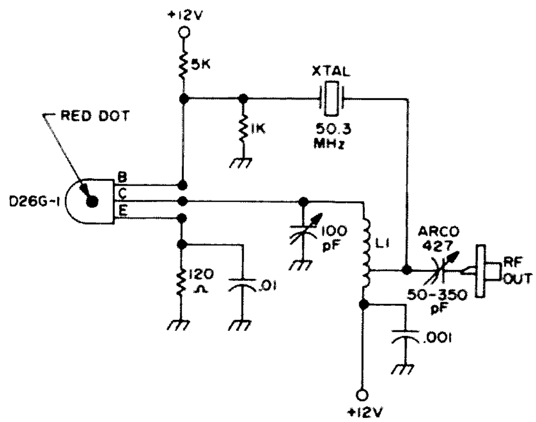


Fig. 1. General Electric D26G-I microtransistor



L1-25 TURNS 28 AWG TAPPED 4 TURNS FROM COLD END, WOUND ON 1/8 in. DIAMETER FORM, APPROXIMATELY 1/2 in. LG.

Fig. 2. Microtransistor crystal oscillator for 50 mHz. The first L1 is 9 turns, airwound, 1 in. long, 5/8 in. O.D., tapped at 2 turns from the cold end. The final L1 was 25 turns of No. 28 tapped 4 turns from the cold end and wound on a 1/8 in. form about ½ in. long.

percentage of amateurs in the ranks of technicians and engineers) can result in them shelling out with some very small capacitors, resistors, and inductors. Let's see what the amateur can do today with microcomponents:

Crystal-controlled Oscillator for 6 Meters

When you first connect one of the tiny little microtransistors as an oscillator, it's kind of startling to see the rf meters move and bulbs – which are several hundred times larger – begin to glow. And it's even more of a shock to find that amateurs miles away can hear you also! What kind of power are we talking about? A good solid 100 mW input for a starter. The GE job is rated at 90 mW dissipation "as is" – and don't forget, if you can light a bulb on the rf you can maintain a QSO over distances up to 50 miles!

A practical circuit of a 6 meter oscillator is shown in Fig. 2. At 12V the dissipation maximum of 90 mW is soon reached with 7 to 8 mA. But, at 40 to 50% efficiency you've got almost half of the dc input power going up to the antenna, so you can probably use 150 to 180 mW dc input once you get everything tuned up and have good output.

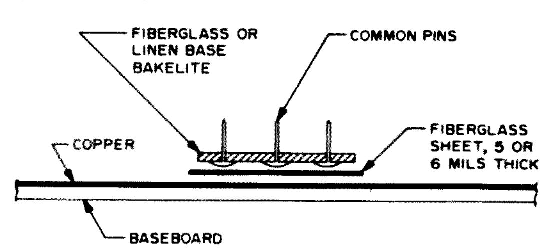
Details of component size, mounting methods, test layouts, and output checking circuits are found in the following paragraphs.

Size Reduction

This is not easy, if you're trying to match down to the size of the device. On the micrometer the D26G-2 shows 54 mils (thousandths of an inch) thickness and about the same for length, which comes to less than one cubic sixteenth of an inch in volume. You have to use tweezers even to think about mounting it. We do have resistors to match, almost. The 1/10th watt Allen-Bradleys are only some six times larger, and Sprague Electric in Nashua, N.H. makes some even smaller. Perhaps some readers know of some that match the device in size? 50th watt? 100th watt?

Capacitors are getting near to size also, with Mucons, made by the Republic Electronics Corp., Paterson, N.J., about 4 to 5 times bigger than the device. These are cylindrical in form and only 60 mils diameter, so they fit nicely in small places. You can see that we're still a little ways off from complete size matching, but it will do for a starter.

Next comes LI and this is really a project. We'll go through a sample run to show you what's involved. There are micro-coils in existence, but I can't see advising homebrewers to use a lot of coils that cost $3 to $4 at this time. Let's see what we can wind up as quickies for pennies for ourselves out of a few inches of small wire and impregnated paper forms. You will see 75 mW rf output to let you in on an advance secret. If a satisfactory tuning core can be obtained to fit into a 1/8th or 1/16th inch form, and which will



1- CEMENT ASSEMBLY TO BASEBOARD USING COIL DOPE FOR PERMANENT USE.
2-USE HIGH-Q COIL WAX FOR TEST SET-UP

Fig. 3. Side view of mounting terminals. Note: cement the assembly to the baseboard with coil dope for a permanent unit. Use a high-Q coil wax for a test setup.

tune without loss in the 50 to 150 MHz range, this will do away with the variable capacitor and bring us down to an overall thickness for the rig of under 1/10th of an inch. Right this minute this is just a sort of dream, but keep reading.

Test Mounting

My immediate thoughts on seeing the microtransistor with its 5 mil gold leads for the first time concerned the handling and mounting. You can get used to this soon enough, even though in my case, having arrived in this world in 1904, I now use fitted glasses with 2X power of magnification. The first thing is the question of subminiature "binding posts" (as they used to be called), and for new readers a brief description follows. Figure 3 shows a side view of one method of making these items that will only cost you a trip to the 5¢, 10¢, and $20 store. I use the 21 mil diameter "Bank Pins," and drill a 20 mil hole in a thin piece of fiberglass or linen-base Bakelite. When these pins are driven through these holes from the underside and then soldered on the top side they *don't* pull out. Figure 4 shows a top view of the three pins used with the microtransistors and various small capacitors, resistors, and inductors also attached, with approximate layout for testing.

You can see the items that need plenty of size reduction work, such as the crystal, the trimmers, and of course the inductance itself. The small one shown here in the final circuit however, sacrifices nothing in power compared to the "big" airwound coil used for tests. It puts out 30 to 40 mW.

A lot of the size reduction work mentioned means finding suppliers who can furnish subminiature components at a reasonable cost. This is sometimes a lot harder than the benchwork involved.

Figure 5 shows a handy filter to keep rf away from the battery leads where it can otherwise cause lots of trouble for you when more stages are used, such as amplifiers and/or multipliers. This trouble by the way is very hard to identify as it causes feedback paths with odd phase effects through the battery leads. You may be

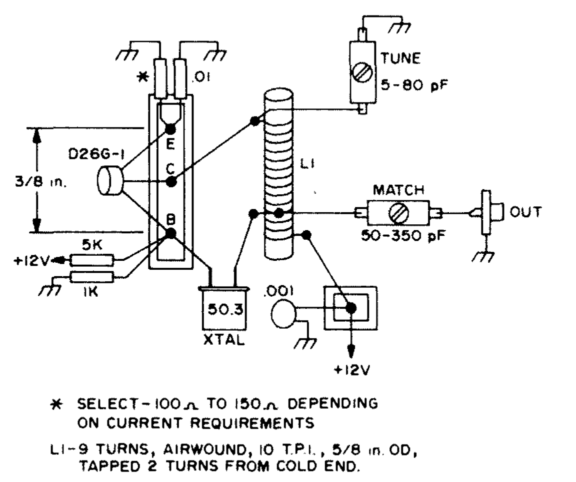


Fig. 4. Layout, top view, of circuit in Fig. 2.

using separate batteries for tests and everything is going fine, and then when you start connecting to a common battery everything goes suddenly haywire. Use the filter.

Certain things can be done to reduce size after this circuit and operation is firmed up. For instance, the main amount of capacitance in a large trimmer may be obtained by using a fixed capacitor with a small trimmer in parallel. The Arco 402 midget trimmer runs 1.5 to 20 pF and is only 9/16ths long by 3/8ths wide. This is still "huge" compared to the device, but it can be used.

The same thing can be done for the tuning capacitor across L1. The whole question of size for tuned circuits is wide open so far, as you can easily see.

Matching Outputs

Starting out on a try for power (don't laugh now, remember that guy who laughs last . . . and also the "mile-per-milliwatt" formula), it seems at first preposterous that a tiny speck of material shown in Fig. 1 could ever generate enough rf to actually light a bulb. Indeed, at the first try it only showed one volt at the test diode dc output (see Fig. 6).

Incidentally, the matching values shown were not arrived at immediately. R4 is very important because you can easily draw over ten mils with various tuning setups in the oscillator itself, as mentioned. When all the parameters such as feedback tap, emitter resistor, L1, C1, the crystal, the transistor itself, and the proper output match, are

all working together you can then push up the output power, with the internal dissipation going up to the maximum of 90 mW. Assuming an efficiency of 40 to 50%, that is, with everything matched and tuned up with some half of the dc input power going up to the antenna in rf form, you could run some 10 mils at 12 volts, or even a little more. Note however that if detuning or other mismatch should occur you may dump all of that input into dissipation, and goodbye to your little microtransistor.

Working with CI and the feedback tap on LI, and always with R4, things started to pick up, with the output climbing toward 5V dc out of the test diode D1. At this point, which indicates some 15 to 20 mW of rf output, I started checking with a No. 48 bulb that glows a dull red on 18 mW. It didn't light yet, but finally with the match shown in Fig. 6 it did, and before long, that is, another hour or so, it was up to about 40 mW, still keeping the total dc input to 120 mW or less. Maybe one could immerse that tiny little blob in oil? We used to do just that back in the early 1920's, taking the metal base off the "powerful little five watters," which were the Radiotron 202 tubes, if I remember correctly back to that far-off circa of some 46 years ago, and put them upside down in a gallon can of transformer oil. Then run 100 watts. I may try this on the little blobs if GE or Bill A. sends me a couple dozen more devices. That kind of work is usually called "test to destruction."

So finally the output circuits of Fig. 6 were worked out, using the temporary C1 and LI and we started reducing these components down to size.

Small Size Tuning Inductors

There has been a lot of talk about the theory of using transistors and making them "act like inductors," but so far I don't see any on the market. So, while watching and waiting we'll get along with small coils. You may be surprised at what they can do. I was.

So here we go with spools of small wire up to No. 36 in size, and coil forms down to 1/10th of an inch in diameter.

Coil No. 1 was airwound, ten per inch, 9 turns, 5/8th O.D. which was used as a standard. No. 2 was 12 turns of No. 20 on 1/8th inch paper tubing. It worked fair to good, but required nearly 100 pF of tuning capacity. No. 3 coil was also on 1/8th inch O.D. tubing but with 25 turns of No. 28 dcc (double cotton covered), with tap at 4 turns. It worked as well as the first reference coil. This No. 3 coil is huge compared to the device, but there is a question of just how much time you can spend on microcoils. Coil No. 4 was 25 turns of No. 38, tap at 5 turns, two-thirds jumble wound. It oscillated well, but only had about one half power out. No. 5 was 25 turns of No. 34 dcc, tapped at 5 turns, 90% jumble wound, with output tap at 3 turns. Only fair output. Referring back to coil No. 1, it was found that the use of a tap instead of a separate link output winding gave more output. Coil No. 6 was 25 turns of No. 26, tapped at 4 turns for the emitter and 2 turns for the output. Output went up to 5.5V, holding the current at 6 mils. Tapping on the output at 4 turns along with the emitter brought the output up to 6V. This looks as though we are zeroing in on what is needed. This No. 6 coil is 5/8th of an inch long and the O.D. is about 3/16th of an inch, which may be the best compromise for now.

Checking to see how close to the copper-clad baseboard such a coil could be placed it was found that there is only a 1 or 2% reduction when the coil was practically touching the copper. To be exact, it was about 1/32 of an inch away. The tap at two turns was almost as good . . . not too critical. The feedback tap at 4 turns and output tap at two, worked well. CI is around 20 pF and thus the small Arco

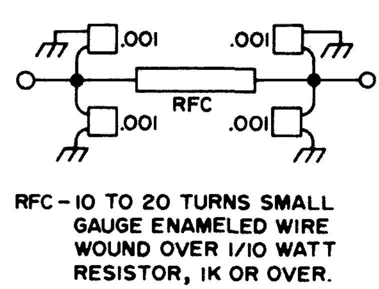


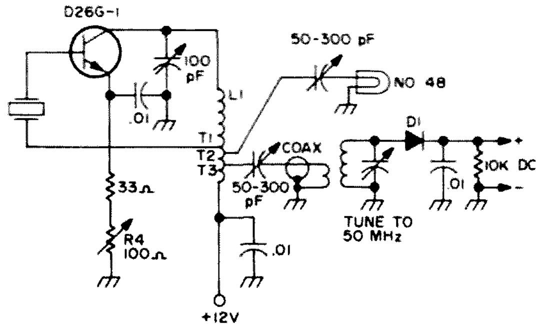
Fig. 5. Dc battery filter; C = .001, 1/8 in. square. RFC = 10 to 20 turns of any small size wire on 1/10th watt resistor over 1K.

midget trimmer can be used, but a check was made anyway with reducing the number of turns on coil No. 6. With 15 turns the output was only 1.5V, so that was n.g. Coil No. 7 was 20 turns of No. 28, with tap at three turns. Only 2.5V output.

We are going to describe an rf amplifier and frequency multiplier using these little specks, but there are two good reasons for peaking up the power from the cyrstal oscillator. First, if it's a good oscillator it will be more stable and operate well on reduced battery power and with aging. Second, you may want to try it on the air. Modulating a crystal oscillator is perfectly legal, at around 80%, and if RCA can do it so can we.

There is an interesting forumla which comes out at "a mile per milliwatt," but more on that later.

Different types of output coupling were also tried and while a pi-network furnished slightly greater output under certain conditions, link coupling and tapped on coupling light bulbs and furnishes good output power to 50Ω cables as well. With a little more care and testing, the best inductance which we have found so far involves a rather large value of trimmer, but is easy to wind and does light a bulb to around 40mW and produces well over 5V on the diode test. This is shown in the final circuit, Fig. 6, where the feedback tap is seen to be the output tap as well. It works fine, is a strong oscillator, and produces good drive into the rf amplifier shown later.



T1 – TAP AT 4 TURNS FROM COLO END OF L1
T2 – " " 2 " " " " " "
T3 – " " 1 " " " " " "

USE ONLY T2 OUTPUT OR T3 OUTPUT, NOT BOTH.
L1–9 TURNS

Fig. 6. Power indicator and output matching. Use only one of the outputs at a time, either the pilot bulb or the diode power indicator.

Rf Power Amplifier

As suggested before, don't laugh; that tiny bug is putting out 75 mW, amplifies, matches, tunes in fine shape, and has not self-oscillated yet. Figure 7 shows the final schematic with the layout as in Fig. 8. I started out with dc bias on the base but soon found that the oscillator's 20 to 30 mW of rf was enough to push the amplifier collector current to 20 mA, which is certainly more than the rated amount for continuous use. An rf choke was installed between base and ground, a usual method with amplifiers, and the input was set.

Tapping the collector down on L1 resulted in better tuning and more output, so it was checked up and down L1 for the best output, which occurs when the collector tap is near the middle of L1.

There is an impressive dip in current at resonance, always a welcome sign in solid state amplifiers, and by varying C4 this dip, which is much smaller of course when the amplifier is loaded, and the maximum rf output, could be adjusted very precisely.

The emitter behaves according to Hoyle also with a smooth climb in mA and output power as R1 is decreased from 133Ω down to 33. Be careful there, because at 33Ω you may be getting too much current.

I'll have to get more information from GE on the question of maximum dc power in and rf out, because they rate this chip at 90 mW dissipation. With 14 mA input at 12V, for a dc input of 168 mW, it puts out at least 75 of rf, and 75 from 168 leave 93 mW, which is the present rated limit. These devices are not expensive however, so it is more a question of the trouble of opening the shielding enclosure and soldering in a new device. I have a drop of wax on the outside of the plastic case to see if it gets hot enough to melt, but that may not tell the proper story. Even if it was a metal case, there is a real tiny chip inside that can get hot and melt if the internal leads do not carry away the heat to the outside. This whole rig is supposed to eventually fit inside a cigarette-sized package, so perhaps we should be content with a good clean 75 mW. There is also the question of modula-

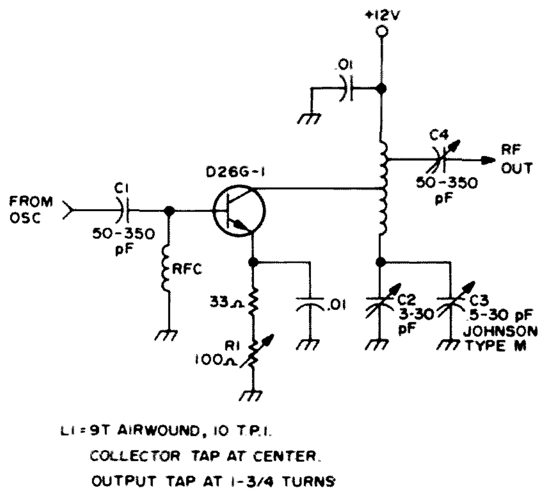


Fig. 7. Microtransistor rf power amplifier. L1 = 9 turns wirewound about 1 in. long, with the collector tapped in the center and the output tap at 1¾ turns.

tion with its double collector voltage for AM. For two meter relay work and FM it's practically ready to go.

Collector inductance tests were run on this unit and the 1/8th inch coil form showed up as at least 98% equal to the No. 1 coil. Apparently the loaded Q does not differ much from one coil to the other. In certain cases however, the loaded Q being higher might well be needed for selectivity, as in a heterodyne vfo, or in tripling.

A Frequency Multiplier

Inasmuch as the internal chip in the GE

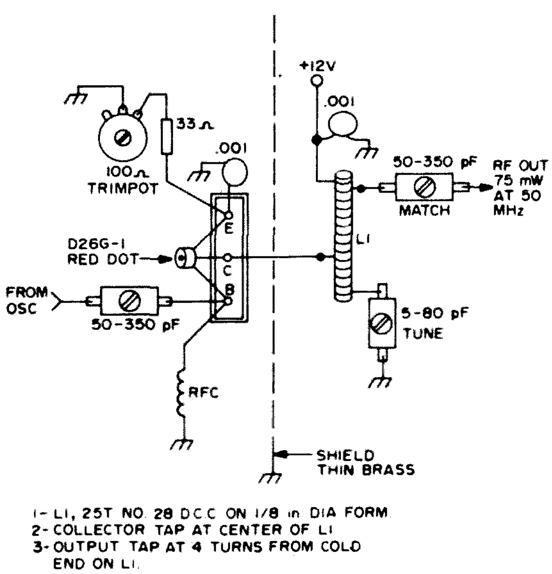


Fig. 8. Layout of rf amplifier. L1 = 25 turns No. 28 dcc on 1/8 in. form, collector tap at center and output tap at 4 turns from the cold end.

D26G-1 is a 2N918 type, which is a well-known UHF device, it should work well as a multiplier, and it did. With some change in the base bias, which needs to be increased for multiplier service, another collector coil for the higher frequencies, and changing the oscillator to 48 MHz, it took off like a bandit on 96 MHz as a doubler with some 50 mW output. After several hours of tuning and pruning for a tripler stage, 5V of dc was registering at the tuned diode meter on 144 mHz, which is in the neighborhood of 15 to 20 mW output. The circuit should be considered as temporary as this is just a "get-acquainted" one. It is essentially the same as shown in Figs. 7 and 8 with a change in L1, which is now 2 turns, airwound, 10 per inch, 5/8ths diameter, tapped at 3/4 of a turn for the output, and tuned by C3 only. C2 is left out. Be *sure* and check for 96 and 144 MHz with an absorption wavemeter as you double and triple.

Note that the collector does not like to be tapped down on L1 when working as a multiplier.

A 432 MHz crystal exciter will be an interesting project, especially with some of those 2 GHz experimental microtransistors Bill Ashby sent up. 1296 vest-pocket rig?

Trouble Dept.

Have a good laugh on me over this one! Switching coils around while testing on the rf amplifier and multiplier circuits, I went back to Six and the power output suddenly was very low. Everything tuned nicely, the oscillator peaked properly, etc., but there simply wasn't that good old 75 mW output. Only about 25 to 30. Worse still, the emitter resistor would *not* bring up the power, it *dropped* it! I checked the base input circuit, the collector tuning, no soap; then, not a bright flash but rather a kind of dull awakening seeped in. How many times I had warned readers to check the frequency of output circuits with an *absorption* meter. Quick like a bunny (a 65 year old one) I reached for the 50 to 150 MHz wavemeter and there it was, not 50 MHz in the collector circuit but 100 MHz! I had a good double but I wanted an amplifier at

that moment. Naturally the emitter pot did not bring up the power because a doubler needs more bias than a straight through amplifier. I had forgotten to solder back in the 3 to 30 pF trimmer additional capacity across L1 and was peaking on 100 MHz. Just for fun I looked back through the years to see when I first worked with a multiplier and found it was circa 1939–1940, doubling from Five to Two and a half meters, a little matter of thirty years ago. The QTH was Greenwich, Conn., and the call was W1LAS, in case anyone else is still around from those days.

So, keep those absorption meters on hand and use them.

One interesting point. Are the elements and leads on this device so small that there is a smaller feedback capacity than usual? Whatever the reason, which I'm going to inquire about on some of my next visits to the manufacturers, this microtransistor, the GE D26G-1, a miniature 2N918 type, has been free from self-oscillation to date.

It appears that pocket size, hand-held VHF sets for repeater testing, talking through repeaters and just plain QSO's for fun can be built by the amateur home-brewer using these devices. Some components need a lot more reducing diets, and some are nearly ready right now, as to size.

. . . K1CLL

MEET THE NANOFARAD

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Our old friend, the microfarad, has been with us for a long time. He was a handy unit when about the smallest capacitance we used was a "triple oh two five" grid condenser for a UV-201-A tube. We got somewhat disenchanted with our old friend when we started talking about "six oh point two" as the grid-plate capacitance of a vacuum. Then we trotted out a monstrosity, the micromicrofarad. This turned out to be just too much of a mouthful to utter in rapid conversation. The next step was to revive picofarad, which had a wave of popularity in the twenties but was quietly dropped when someone alleged that the prefix had a naughty connotation in a certain unidentified language. Picofarad worked quite well, but there remained a disconcerting gap between it and microfarad that could be filled only by using an awkward multidigit expression such as "fifteen thousand picofarad," which left half your listeners wondering just what part of the familiar microfarad you were talking about; or by using an equally awkward fraction of a microfarad.

But, patience, there's rescue at hand. It's the nanofarad, which falls midway between the micro- and the pico- and takes full care of those puzzling multiples or fractions.

You can get the nanofarad firmly infixed into your mind and vocabulary by remembering a simple relationship: 1000 picofarad equals one nanofarad equals 0.001 microfarad. So that "double oh two" μF becomes a simple 2 nF and that fifteen thousand picofarad becomes a much more straightforward 15 nF. Makes life much less complicated, doesn't it? Give it a whirl.

. . .W5JJ

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Frequency Synthesized HT-220

Part 1

The very popular HT-220 handi talkie has suffered many modifications at the hands of amateurs, but none so extreme or unusual as this one. With apologies to Motorola, I will describe for you my 400 channel, frequency-synthesized HT-220. This article will cover a general description of the theory of operation. Part II will give the actual circuitry used in the rig. This is not a construction article, as such, although the experienced builder should have no trouble duplicating the work.

The rig to be described was assembled with the knowledge that it would probably not work the first time and would require much in the way of modifications and twiddling. Most of the circuitry was assembled on plug-in circuit boards which were later modified. New circuit boards have not been designed at this time. The wise builder should place all of the circuitry on one board since all of the changes necessary to make the gadget work are presented here.

The idea for this transceiver was born as much out of frustration as out of necessity. When I first got on 2m FM, the local 34/76 machine was changed to 16/76 two days after I bought a 34 crystal. At that time I decided to find out what a synthesizer was and how to build one. At the same time I was discovering the world of integrated circuits. I decided to build the FS-220 (original, isn't it) using all TTL logic. Nine months later the FS-220 was born (time lapse also coincidental).

The rig was designed to be the ultimate in flexibility and to take advantage of the low-cost TTL logic now available. It was built around a surplus HT-220 circuit board, the "universal" type with a T/R relay rather than a PTT switch. The basic characteristics of the rig are:

Frequency coverage of 144-148 MHz.

400 independent receive and transmit channels with 10 kHz spacing.

Digital readout of all frequencies.

IC memory which stores the receive and transmit frequencies and is programmed from a Touch-Tone(R) pad.

TT pad operates normally when not used for programming.

Scanner which may be set to cover either 50 or 100 frequencies within a 1 MHz range (10 kHz steps).

Powered from 12-15 Vdc (2A receive, 2.4A transmit).

Modular construction for ease in modification and repair.

Construction cost less than $200 if surplus houses and junk boxes are well scoured.

Operation

Before getting into a block diagram of the rig, an example of its on-the-air operation should make clear what the above charac-

teristics provide. Let us consider working a repeater with non-standard frequencies so that no numbers are duplicated. To operate on 23/84, the front-panel MHz switches are set for 146 MHz operation as indicated on the readout (see front panel photograph). The CHAN REV switch should be in the NORM position, and the SIMPLEX and SCAN switches should be off. The OPERATE-PROGRAM switch is placed in the PROGRAM position and the repeater frequencies are punched into the pad, receive frequency first. . .8. . .4. . .2. . .3. For those who cannot reverse the frequencies comfortably, the numbers can be entered as 2. .3. .8. .4. .plus any two other characters, such as 0. .0. . or *. .*. . The OPERATE-PROGRAM switch should now be returned to the OPERATE mode. The digital display will indicate reception on 146.84 MHz. When the PTT switch is depressed, the display will change to 146.23 MHz and the transmitter will be keyed. For SIMPLEX mode, this switch can be placed in either the A or B position with the result that the rig will remain on either 146.84 or 146.23 MHz for both transmitting and receiving. To go "reverse-repeater," simply place the CHAN REV switch in the REV position. The display will change to 146.23 MHz and you can listen to the inputs to the repeater and transmit on 146.84 MHz.

For scanning, the SCAN switch is placed in either A for 100 steps, or B for 50 steps. In position A, the receiver will scan from 146.00 to 146.99 MHz in 10 kHz steps and the display will follow it. If a signal is encountered, the scan will stop and the display tells you what frequency you are listening on. Two or three seconds after the carrier goes away the scan will pick up again. With the SCAN switch in the B mode, the receiver scans from 146.50 to 146.99 MHz in 10 kHz steps. My scanner takes slightly less than 5 seconds to scan the upper half of the megahertz and is convenient for listening only for repeater outputs. When the scanner is turned off, the rig returns to the frequency pair programmed into memory, in this sample case, 23/84.

Any 1 MHz range can be covered by setting the MHz switches on the front panel. This does allow you to receive on 146.50, for example, while transmitting on 144.10, or some other weird combination (like 146.40/147.00 MHz).

Block Diagram

Fig. 1 is a block diagram of the complete transceiver. The actual frequency synthesizer

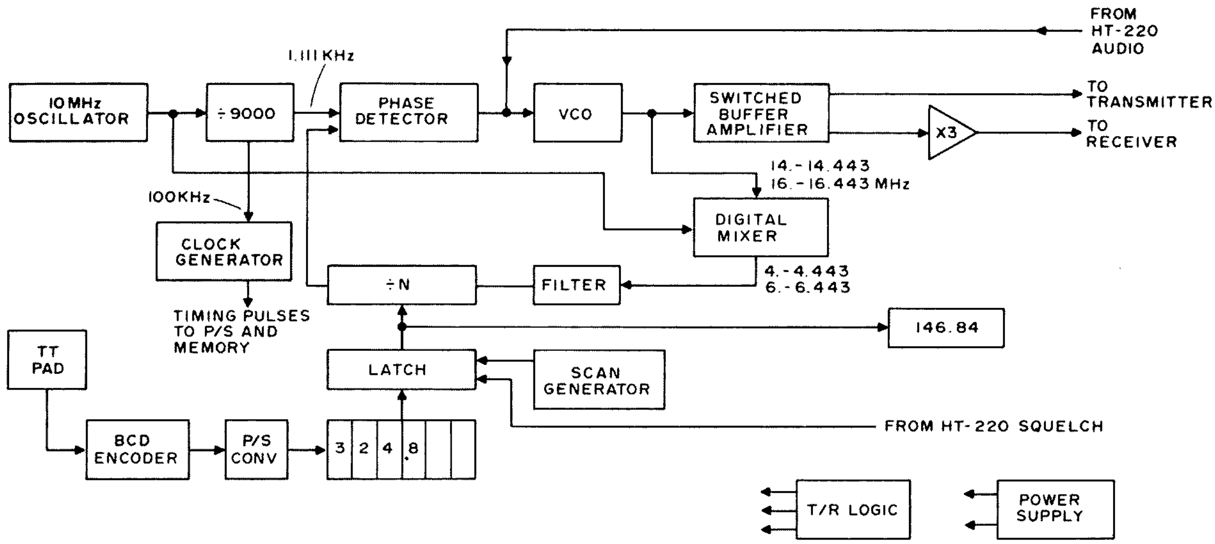

Fig. 1. Block diagram.

portion of the rig is almost conventional, but does have one feature not ordinarily found in amateur gear, a digital mixer. The main frequency determining element is a voltage--controlled oscillator (VCO) consisting of a single IC. Its frequency is controlled by a dc voltage derived from a phase detector. The range of frequencies it can cover is switched by changing the LC constants. On receive, the VCO covers 14.000 – 14.443 MHz and 16.000 – 16.443 MHz on transmit. Its output is tripled and fed to the HT-220 receiver for LO injection and also goes directly to the transmitter where it is multiplied by nine. The VCO is locked on frequency by the phase detector which uses a 1.111 kHz signal as its reference (these derived from a 10 MHz crystal controlled oscillator. The 10 MHz signal is divided by 9000 in a fixed divider chain. To provide the second input to the phase detector, the VCO output is first mixed with the 10 MHz from the crystal oscillator to give 4.000 – 4.443 MHz on receive and 6.000 – 6.443 MHz on transmit. The mixer used is a digital mixer (an "exclusive OR" gate). Its output contains just about every combination of the two input frequencies, so filters are used to select the desired range. The filter outputs are divided down to the 1.111 kHz range in a programmable divider. During receive, the ÷N programmable divider is programmed to divide by 3600 – 3999. For example, to listen on 144.00 MHz, the LO injection must be 126.00 MHz (18 MHz 1st i-f). That requires a VCO output of 14.000 MHz (14.000 x 9 = 126.00). The output of the digital mixer is then 4.000 MHz. When this signal is divided by 3600 the result is 1.111 kHz. By the same reasoning, 4.443 MHz also gives 1.111 kHz when divided by 3999. For transmitting, the programmable divider (÷N) is set to divide by 5400 – 5799. Since the 1st i-f in my HT-220 is on an even megahertz (18.000 MHz), the last two numbers in the number N always equal the hundreds and tens of kilohertz at 2m. During transmit, the third number in N always equals the megahertz. This is a convenience, but not a necessity. *This scheme can be easily used with i-f frequencies such as 10.7 MHz with only slight changes in the ÷N programming* (see K2OAW's article, October, 72).

Most synthesizers use a formidable array of switches to program the ÷N counters. I wanted to have a digital display and a TT pad on the front panel. The thought of also including an array of switches didn't appeal to me (I really wanted to play more with IC's). To get away from the problem, I devised the scheme for using the switches on the pad to do the programming. The hams around Dayton feel that the circuit is the product of a deranged mind, but it does work and is really quite a convenience. It also is good for several minutes of chatter on the repeater most any time.

The switches on the TT pad (not the

DECIMAL NUMBER	BINARY–CODED DECIMAL EQUIVALENT			
	(8)	(4)	(2)	(1)
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

The decimal number is the sum of the rows containing a "1". Example: 7 equals 0 + 4 + 2 + 1. The decimal number 82 would be 1000 0010.

tones) are used to enter the desired frequencies into the IC memory (hundreds and tens of kilohertz). First, the output of the pad is encoded in binary-decimal format (BCD). The output of the encoder consists of four lines. The signals on these lines represent the decimal number punched on the pad. A logical "0" is equal to 0V and a logical "1" is equal to about 3.5V. Using these zeroes and ones, the decimal number 2 would come out as 0010, as shown in Table I. The BCD equivalent of the decimal number goes to a parallel-to-serial converter where the four lines are changed to only one. Instead of four signals on four lines, the output of the P/S converter is on one line, with the four signals being transmitted down the line one at a time. For the decimal number 2, the output of the P/S converter would be 0. . .1. . .0. . .0. . .whenever the 2 button was pushed. The timing pulses required to do the conversion are derived from the clock generator. A 100 kHz square wave is taken from the fixed ÷9000 chain and used to generate the required pulses. As a result, the four signals making up any one decimal number are sent down the line from the P/S converter at the rate of one signal every 10 microseconds. At the other end of this line is the memory. It is a left/right shift register with parallel input/output capability. Mine has a capacity for six decimal numbers (24 bits, each signal in a BCD number being a "bit"). The bits enter the memory from the left. With the example used earlier for 23/84 operation, let us assume that the numbers are punched in as 8. .4. .2. .3. . When the 8 is punched, it is converted into a serial BCD format and gets "shifted" into the left-most slot in the memory. This takes 40 microseconds. When the 4 is punched, it also gets stored in the left-most slot in memory, but the 8 has been shifted to the right at the same time. After the four numbers have been entered, the memory contains these numbers (in BCD form) as shown in Fig. 1. Notice that the output from memory is from the center eight bits (center two slots) and is the receive frequency. For the other mode of entry (six punches), the receive frequency is also in the center two slots, but the transmit frequency will be in the two slots at the right side of the memory. To get the transmit frequency all the way over to the right requires those two extra "inputs."

The output from the memory goes to a 4-line data selector which acts as an electronic 4 PDT switch. It selects either the output from memory or the output from the scan generating section. The output of the data selector enters a temporary storage area consisting of latch ICs. The latches do several things. First, they hold the current frequency while the memory is being programmed. This allows you to listen to one channel while punching in another. When in the scan mode, the latch is the element that stops the scan when a squelch signal appears from the HT-220 receiver. The digital display is fed from the output of the latch (at least the hundreds and tens of kilohertz).

The output of the latch elements supply the hundreds and tens of kilohertz necessary to program the ÷N counters (for example, the 84 in 38*84* for reception on 146.84). The 3 is programmed by the T/R logic (*3*884) and the 8 is set by the front-panel CHANNEL B MHZ switch (3*8*84). During transmit, the only difference is that the T/R logic sets the first number to 5 (*5*623) and the CHANNEL A MHZ switch sets the 6 (5*6*23).

If you have been following this nightmare closely you are probably wondering how the proper megahertz gets displayed during receive. Look back at the examples and you will see that for any given receive frequency, the ÷N counters must be set to divide by a number that is higher by 2 than the received megahertz (to receive 14*6* MHz the ÷N must

be set to 3800). To get the proper display, a simple circuit is used which subtracts 2 from the ÷N number before going to the readouts. The 14 portion of the digital display (144.57 MHz) never changes, so it is permanently wired on. This also eliminates the need for two seven-segment driver ICs. This scheme for subtracting (or adding) will be described next month. It can be used with any synthesizer to give a digital display without thumb-wheel switches. It must be taylored for the particular range of ÷N numbers in use.

The clock generator provides the necessary pulses for the memory to store the input frequencies. It also causes the memory to shift between transmit and receive. As described earlier, when programming is done, the desired receive frequency is being output from memory. When the PTT switch is closed on the microphone the T/R logic commands the memory to shift right and the clock generator sends the memory 8 pulses (CHAN REV switch in the NORM position). These 8 pulses are sufficient to move the receive frequency to the right side of the memory and to move the transmit frequency into the center two slots. When the PTT switch is released, the T/R logic commands a shift-left, and 8 pulses from the clock generator restores the synthesizer to the receive frequency. Everything is just the opposite, of course, if you use the alternate mode for programming (CHAN REV switch to REV and enter transmit frequency first). The time required to shift the memory is only 80 microseconds. This is negligible compared to the 50-100 milliseconds required for the phase-locked loop to stabilize on the new frequency.

In the scanning mode the data selector picks the hundreds and tens of kilohertz numbers from the scan circuitry, rather than from memory. The scan circuitry is simply two IC counters, a 7490 and a 74192, set up to divide by either 50 or 100. A simple free-running oscillator feeds this counter with a 10 pps square wave. The output from the ICs is taken from the "Q" output of each flip-flop, giving the BCD equivalent of all integers from 00 to 99. The 74192 can be programmed to reset to 5 rather than 0, restricting the output numbers to 50-99.

When a carrier is encountered, a squelch signal from the HT-220 freezes the frequency in the latches. This prevents the PLL from changing. The scanner goes on generating new frequencies, however. I used this scheme because I couldn't get my oscillator to start and stop quickly enough to suit me.

Miscellaneous

The power requirements of the TTL packages are taken care of by single package voltage regulators (LM-309) mounted on the rear of the chassis. The T/R logic has provisions for keying an external relay if needed. The audio for creating FM is taken from the HT-220 board and fed directly to the dc control line of the VCO. The output of the TT pad is connected to the microphone input in standard fashion.

Next month I will describe the circuitry used to accomplish all the good things just presented. Many of the individual circuits will find applications in other amateur projects.

... W8KBC

Saving Tubes In The Galaxy 5

After seeing how hot those TV-type tubes in the final of my Galaxy V Mk 2 were running – and having one go out soon after installation, I decided to install a small fan above that section of the rig where these tubes are. The fan is a small open motor unit with a 4 in. blade, which sells for about $2.50 at several of the radio houses. Mine is mounted on aluminum brackets on a pegboard and is about 2 in. above the top of the transceiver. Any of several methods may be used for mounting, depending on existing surroundings.

The motor is wired so that the fan turns on automatically with the unit so that it goes continuously. Since installing the fan about a year and a half ago, the tubes have not needed replacement and show no signs of weakening.

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repeater GOVERNMENT...

An organization needs some rules with which to govern itself to accomplish all the things that it takes to keep a good repeater on the air. These rules are usually called the Constitution and the bylaws. Unfortunately, a lot of the bylaws never seem to get written, or officially adopted, and seem to die their own natural death.

The Constitution and bylaws are very important to persons other than the immediate club members. You need to provide copies of the Constitution and bylaws to at least three governmental agencies. These are the Federal Communications Commission for the repeater groups club station license, The Secretary of State for your incorporation charter, and to the Internal Revenue Service for your Code 501-C Non-Profit Organization Corporate Income Tax Exemption.

In addition to your clubs 200 or so members, the three governmental agencies bog down changes to your clubs Constitution and bylaws. Reproduction alone, or plain ink on paper is a monumental task, not to mention redistribution of the changes to everyone that is suppose to have the copies and changes. Sure would be nice if one complete and thorough Constitution and bylaws could be made, adopted and submitted to the membership and agencies, and never have to be changed again.

The following Constitution and bylaws are such an attempt, that is, to try to be as complete and all encompassing as is possible, so that there will be no big changes looming on the horizon within 30 days after you have reproduced and sent all that paper to all concerned. Here is how it goes:

ARTICLE I – NAME

The name of this organization shall be ROTTEN RADIO REPEATERS, INC. (Obviously, a fictitious name used here for explanatory purposes. Since the constitution and bylaws need to go to at least three governmental agencies, it would be well to select a name that is catchy, meaningful, somewhat sophisticated. See "Repeater Economics" in April, 1973, issue of 73 Magazine.), a non-profit organization hereinafter referred to as the Club.

ARTICLE II – OBJECTIVES

The objectives for which this Club is organized are:

1. To render a public service to governmental agencies during impending storms or severe weather, as well as to assist in disaster relief operation and other community functions as required.
2. To unite the amateur radio operators of this area for the purpose of exerting effectively a combined influence upon matters concerning amateur radio operation.
3. To promote good operating procedures and the exchange of technical information and assistance.
4. To stimulate adherence to a code of ethics, both written and understood.
5. To admonish members to comply with existing FCC rules and regulations.
6. To be an influence to new amateur operators of the area in the operation of their station.
7. To promote good will and fellowship among the members.
8. To further the art of electronics and encourage prospective members to participate in the purposes of the club.

ARTICLE III – MEMBERSHIP

SECTION 1. Eligibility for membership in the club is set forth as follows:
Any person is eligible for FULL MEMBERSHIP provided that:

a. He holds a valid Amateur Radio Operator/Station license.

b. He indicates a desire to become a member.

Any person who was included in the original organization of this club will be considered as a CHARTER MEMBER.

SECTION 2. To become a member of the club, a person who is eligible must furnish his name, address, call sign, telephone number, and annual dues to the Secretary-Treasurer.

SECTION 3. Honorary Membership may be bestowed on any eligible person by a majority vote of the members present at any regular or special meeting. Honorary memberships will not be for more than one year. Honorary members will not have voting privileges.

SECTION 4. Eligible persons residing in the same household may be granted full membership privileges by payment of $1.00 provided that one member of the household has paid full annual dues. All members of the same household shall have the same anniversary date.

ARTICLE IV – MEMBERSHIP PLEDGE

Each member shall pledge himself to adhere to the best of his or her ability to:

a. All applicable FCC rules and regulations.

b. The requirements of this constitution.

c. The By-laws.

d. The code of ethics adopted by the club.

ARTICLE V – VOTING PRIVILEGES

All full members shall have full voting privileges providing they are not delinquent in their dues and assessments.

ARTICLE VI – EXPULSION

Members of the Club may be expelled in accordance with such procedure as may be established in the bylaws for violation of this constitution, violation of the code of ethics of the club, or for other conduct which would tend to cause discredit to fall upon the club or upon amateur radio as a whole.

ARTICLE VII – RESIGNATIONS

Any Member has the prerogative of resignation from membership in the club and any resignation will be recognized and accepted when submitted to the Secretary in writing. Resigned members will be restored to the Club prospective membership list upon use of the corporations owned equipments.

ARTICLE VIII – GOVERNMENT

The government of the club shall be vested in the Officers of the club. The Officers of the Club shall be the President, Vice President, and Secretary-Treasurer.

ARTICLE IX – MEETINGS

SECTION 1 Regular meetings shall be held as determined in the by-laws. A Quorum shall consist of 10% of the members.

SECTION 2. Special meetings may be called for any purpose by any Officer of the Club who shall preside over the meeting. A Quorum shall consist of 10% of the members.

ARTICLE X – AMENDMENTS

This constitution may be amended in the following manner:

a. Any proposed amendment shall be first presented at any regular or special meeting for approval.

b. Proposed amendments approved by a majority vote of the members present at any regular or special meeting will be submitted to the entire membership for a vote to adopt proposals.

c. The Secretary-Treasurer will mail proposed amendments in the form of a voting ballot to the entire membership. The ballots shall include a self addressed envelope plainly marked to indicate ballot.

d. Deadline date for return of the ballots to the Secretary-Treasurer will be plainly indicated on the ballots and return envelopes and must be at least five days prior to the next regular meeting.

e. The Secretary-Treasurer will open the ballots and determine the results of the vote. A two-thirds majority vote of the membership shall be required for approval.

f. If approved, the proposed amendment becomes effective immediately.

ARTICLE XI – CLUB OWNERSHIP RIGHTS

The Club shall have the privilege of owning property both real and personal and the right to buy and sell in the club name according to the provisions of the by-laws.

ARTICLE XII – CLUB STATION RIGHTS

The Club shall have the expressed right to establish and maintain a club station and to establish operating procedures within the privileges granted by the FCC.

ARTICLE XIII – TRUSTEE

The position of Trustee shall be filled as determined by the bylaws.

The constitution should show the acceptance date and must be signed by the Club Officers and two witnesses.

The bylaws are where all the action is, and they should cover every forseeable circumstances. As mentioned before, changes will drive the Officers and Members right up the wall. A fairly complete set of bylaws will look like this:

BYLAWS:

ARTICLE I – CERTIFICATION OF MEMBERS

Upon receipt of application for membership in the club, along with the required dues and information required, the Secretary-Treasurer shall furnish the member with certification of membership in the form of a membership card.

ARTICLE II – OBLIGATIONS AND PRIVILEGES

SECTION 1. Club Obligation: It shall be the duty of each member to support the club with his participation, attendence, time and money to the extent that he feels obligated to help make a success of the organization.

SECTION 2. Code of Ethics: Each member shall endeavor to abide by the Amateur Code of Ethics to the best of his ability.

SECTION 3. Privileges: All members are urged to enjoy all privileges of the club as outlined herein and as offered during the existence of this club.

ARTICLE III – DUES AND ASSESSMENTS

SECTION 1. Each member is required to pay annual dues at the time of joining the club and at the end of yearly intervals thereafter. The annual dues shall be $12.00 which may be paid in the calendar quarters by Transient Persons, Students and Senior Citizens.

SECTION 2. The Secretary-Treasurer will notify all members of their expiration dates and the date which they become delinquent.

SECTION 3. Any delinquent member maybe reinstated at any time. His anniversary date will be changed to reflect the date of reinstatement if the deliquency exceeds three months, providing the delinquent member has not used the corporations equipment during the delinquent period.

SECTION 4. Family members annual dues shall be S1.00. Family members are those persons who reside in the same household as a full member who is the head of a family. All members in the same household shall have the same anniversary date. Family members shall meet the requirements of full members under Article III of the Constitution.

SECTION 5. Special assessments may be voted by two-thirds of the membership, provided however, the entire membership is notified in writing the purpose and amount of the proposed assessment at least thirty days prior to the meeting at which the assessment is to be voted upon.

ARTICLE IV – ELECTION OF OFFICERS

SECTION 1. On or about September 1st of each year, the Secretary-Treasurer shall notify all members of the club that the annual election of Officers will be held at the regular meeting of the club during the month of October.

SECTION 2. The term of office of any Officer of the club shall be One calendar year, beginning January 1st and ending December 31st.

SECTION 3. Any Officer may succeed himself in office, if elected.

SECTION 4. At the regular meeting in the month of October, the presiding Officer will accept nominations from the floor. An election will be held and the candidate for each office who receives the majority vote of the members present is elected. Secret ballot will be used.

SECTION 5. Nominees for office shall give their approval before becoming a candidate for office.

ARTICLE V – DUTIES OF OFFICERS

The duties of the Officers shall be such as their titles by general usage would indicate. Specifically, the President shall preside at all meetings. He is an ex-officio member of all committees. He is the spokesman for the club at all official functions. The Vice-Presidents duties shall be to take over all the duties of the President in the absence of the President. He shall have all the authority of the President when acting in the Presidential capacity. He shall assist the President in all activities and purposes of the club. The Secretary-Treasurer's duties shall be to keep the minutes of each meeting. He will keep an accurate financial record for the club. He shall file all reports and documents required by any governmental agency. He will be held personally responsible for the funds entrusted to him and give an accounting to the club on request. All officers will, upon the completion of their term of office, turn all properties belonging to the club to their elected successors and assist the succeeding Officers to learn the necessary tasks required for good government of the club. The Secretary Treasurer will give an accounting of the club members on request.

ARTICLE VI – TRUSTEE

The Trustee position shall be filled by Walt Hoban WA5XXX, until such time that he or the club, by a majority vote at any regular meeting, determines that the office be filled otherwise.

ARTICLE VII – DUTIES OF THE TRUSTEE

The trustee shall be charged with the responsibility of caring for the physical property of the club, as well as acting in the name of the club in matters that may require official trustee action with the approval of the governing body.

ARTICLE VIII – VACANCIES

SECTION 1. A vacancy in the office of President shall be filled by the Vice-President.

SECTION 2. A vacancy in the office of Vice-President or Secretary-Treasurer shall be filled by a majority vote of the members present at a regularly scheduled meeting or at a special meeting.

ARTICLE IX – COMMITTEES

SECTION 1. An Executive Committee shall be established as a standing committee. This committee shall consist of the Vice-President, Secretary-Treasurer, and Trustee. Duties of this committee are to act for the club under the provisions of Article XI of the Constitution and Article XIII of the bylaws.

SECTION 2. Special or Standing Committees may be appointed by the Presiding Officer at regular or special meetings that may be necessary. These committees will function for the club's advantage and will be terminated upon completion of the assigned tasks.

ARTICLE X – MEETINGS

SECTION 1. Regular monthly meetings shall be held at a time and place announced by the governing body. Notification of the membership will be by the best means available under the circumstances.

SECTION 2. Special meetings may be called as prescribed by the constitution.

SECTION 3. Robert's Rules of Order, latest edition, shall be recognized as the authority of procedures governing any regular or special meeting, when not in conflict with the constitution and these bylaws.

ARTICLE XI – EXPULSION

A member may be expelled from membership in the club in the following manner:

a. Proposed expulsion of a member shall be openly discussed at regular or special meeting and the reasons for expulsion explained.

b. The Secretary-Treasurer shall notify the affected member at least seven days in advance of the next regular scheduled meeting, at which time a vote of the members will be taken.

ARTICLE XII – CODE OF ETHICS

A code of ethics, modeled after the code of ethics of the American Radio Relay League, shall be approved and adopted, and adhered to by the members of this club.

ARTICLE XIII – OWNERSHIP AND TRANSFER OF PROPERTY

The club may own property as provided by in the Constitution. Any purchase or sale of club property must have the approval of the majority of the members present at a regular or special meeting. This does not exclude the Trustee from making or authorizing others to make repairs to the station equipment or any corporation owned property to keep said properties fully operational. The operating budget of the Trustee will be approved by two thirds of the membership present at any regular meeting.

ARTICLE XIV – APPOINTMENT OF CHAIRMAN AND COORDINATORS FOR SPECIFIC TASKS

The President shall appoint members to tasks of chairmanship and coordinators to enable this club to accomplish those necessary for the good of the organization. These job titles will be: EMERGENCY COORDINATOR EDITOR of the CLUB BULLETIN, PARLIAMENTARIAN, CLUB AMBASSADOR, and REFRESHMENTS CHAIRMAN. These persons will be directly responsible to the Executive Committee and will attend Executive Committee meetings as invited.

ARTICLE XV – DUTIES OF EMERGENCY COORDINATOR

The Emergency Coordinator shall:

a. Conduct the Sunday Night Round-up Contest and insure that proficincy of the systems of the corporation is in keeping with the public interest. He shall insure that the rules of the contest are current and applicable for various contingencies in which Amateur Radio may assist.

b. Maintain a pyramid alert system of mobile and transportable radio stations that can fulfill existing communications requirements for this local area of this club. He will insure his own and his replacements availability to meet requirements of severe weather and disasters in which amateur radio can assist.

c. He will conduct a test of his alerting system adopted by the club at noon on Saturdays.

ARTICLE XVI – DUTIES OF EDITOR OF THE CLUB BULLETIN

The EDITOR shall:

a. Accumulate, edit when necessary, and publish news from the national magazines for Amateur Radio.

b. He will canvass the Club Officers for material for the clubs bulletin.

c. He will insure that the bulletin is published in a timely manner at the lowest available cost and that the size will fit the mailing budget of one ounce first class to each member, prospective member, exchange club bulletins, and all editors of VHF-FM Columns in the national amateur radio magazines.

d. The Editor will also perform all other publicity tasks in the best interests of the club.

ARTICLE XVII – DUTIES OF PARLIAMENTARIAN

The Parliamentarian shall:

a. Decide all questions of order at regular or special meetings.

b. He shall interpret and enforce Robert's Rules of Order at all meetings.

c. Assist the Secretary-Treasurer in maintaining the card file of prospective members by noting new stations which use the corporations equipments and forward call sign, name and address, and date that the systems were used.

ARTICLE XVIII – DUTIES OF AMBASSADOR

The Ambassador shall:

a. Attend all area, regional, and local coordinating group meetings scheduled for the betterment of VHF-FM.

b. File written report with the Secretary-Treasurer upon completion of scheduled coordinating group meetings.

c. Read the written report at the next regular business meeting in the category of old business.

ARTICLE XIX – DUTIES OF REFRESHMENTS CHAIRMAN

The Refreshments Chairman shall:

a. Provide coffee and donuts at all regular and special meetings from the resources of the club treasury.

b. Insure timely preparation of the refreshments at all meetings.

ARTICLE XX – CONTROL STATIONS

Control Stations for the corporations equipments will follow guidance established by the club station Trustee. The guiding information will be called the Standard Operating Procedures for Control Stations. Control stations allowing error or violation to occur will be placed in probationary status. Control Stations with three or more documented errors or violations will be removed as a Control Station and will return all corporation property to the Trustee.

ARTICLE XXI – FINES AND LITIGATION

All responsible members and prospective members and users of the corporations owned equipments will file their employer information with the Secretary-Treasurer. This information will be used to recover expenses and fines incurred by violations of the Federal Communications Commissions Rules and Regulations. This bylaw establishes an automatic lien on wages, salaries, and other compensation paid to any member, user, or other involved third party when using the corporations equipments.

ARTICLE XXII – NON-PAYMENT OF DUES BY PROSPECTIVE MEMBERS

Prospective members and users of the corporations equipments who decline to pay the annual dues after six invitations shall be remanded to the "LOSERS LIST." This list will be prominently displayed at all regular meetings of the club. All members are discouraged from engaging or contacting listed non-paying persons through the corporations owned equipments. This bylaw is void during emergencies as declared by the non-paying persons.

ARTICLE XXIII – HONORARY MEMBERSHIP FOR DEALERS AND OTHER COMMERCIALS

Any person in the category of DEALER, COMMERCIAL ENTRANT, or other, and any and all relatives thereof shall be tendered honorary membership with all rights and privileges thereof. This includes those persons who are engaged in the radio, electronics, and allied businesses as a dealer, importer, wholesaler, broker, or manufacturer, and all their relatives. Further defined, this shall include those persons who possess State Sales Tax Permits and who file Internal Revenue Service Schedule "C" in the conduct of their business. Relatives includes persons residing in the same household as the above subject individuals.

ARTICLE XXIV – TONE ALERT SYSTEM

The adopted tone alert system shall consist of 1000 Hz signal of ten seconds duration. This tone will be used to alert the membership of severe weather and disasters through the corporations equipments. All members are encouraged to use apparatus to intercept the tone alert.

ARTICLE XXV – NAMEBADGES

All members are encouraged to display the clubs adopted namebadge at all meetings and functions of amateur radio. The namebadge be red and biege with the state emblem.

ARTICLE XXVI – RECRUITING NEW MEMBERS

The Secretary-Treasurer will send an invitation-to-join letter to all prospective members and users of the corporations equipments. He will note on the card file cards the dates that the letters are sent. Prospective members and users who decline to join will be remanded to the losers list in accordance with Article XXII of these bylaws. Invitation letters will be monthly and not with the club's bulletin.

ARTICLE XXVII – SUNDAY NIGHT CONTEST RULES

The Emergency Coordinator will initiate the Sunday Night Round-up contest usually only during the summer months or during the period when daylight saving time is in effect. Specific rules as follows:

a. Contest rules will be transmitted on frequency to all participants.

b. Executive committee will be umpires for point subtraction.

c. Contest area will be restricted to Tarzanial County.

d. The Contest Control Station operated by the Emergency Coordinator will record starting and ending mileage of participants.

e. Participants are encouraged to use procedures that expedite message handling and circuit traffic.

f. All participants must be mobile stations.

g. SCORING: Participants scores are determined as follows:

Signal 82, accident with injury, 100 points – Signal 76, collision with any object, no injury, 75 points – Stop signs missing or knocked down, 50 points – Signal lights malfunction or inoperative, 50 points – Power lines on the ground, sparking or arcing, 50 points – Fire, building, grass or smoke hazard, 25 points – No barricade at manhole cover off, excavation, etc., 25 points – Stalled or illegally parked vehicle in traffic, 25 points – Trees, weeds, or vandalism covering traffic signs, 25 points – Warning flasher lights no working, 25 points – No barricade at chughole in traffic lane, 10 points – Debris, glass, gravel, tree limbs, trash in street, 10 points – Loose domestic animal, horse, cow, dog, 10 points – Dead domestic or wild animal in traffic lanes, 10 points – Loud outside burglar alarms, 10 points – Street marker sign down, missing, or vandalized, 10 points – Natural gas odor, 5 points – Mileage, points per mile 5.

SUBTRACTED POINTS:

Improper location transmitted -25 – Doubling over the frequency in use -25 – Improper procedure -10 – Low audio quality -5.

h. Contest winner will be the mobile station with the highest point total.

i. All contest point standings announced at conclusion of contest.

j. Contest period will generally be two hours, from 7PM to 9PM.

k. Contest session automatically terminated in the event of disaster.

ARTICLE XXVIII – AMENDMENTS

These bylaws may be amended by a majority vote of the members present at any regular or special meeting of this club.

Having a proposed set of Constitution and Bylaws does not mean that you will be able to get them adopted by the membership. The experience of the local club indicates certain areas of question which result in much haggling. A big problem area seems to be the reasonable amount of membership that constitutes a Quorum.

A big argument for having 10% as the quorum is simply because that is what it is in the U.S. House of Representatives. Just as sure as you make it larger, there will always be some major event that will conflict with a very important meeting date. The major event may be anything from the county fair to the new TV show season. Keeping the quorum small probably results in larger attendence at the meetings since more persons will attend just to make sure that a minority will not run away with things of the corporation. As you can see, big haggling area is needed when it comes to discussions about the quorum.

Another head clunking deal is the honorary memberships for the dealers and commercial entrants who are in the radio business. A likelihood exists that these persons may very well be some of the biggest supporters of the local repeater, however; they are also the same persons who the lobbyests can get to should the pressure be increased to "end amateur radio." Recent magazine articles have dealt with this subject with articles such as "Amateur Radio's Last Year," and "Sneaky Proposal." It may cost your club a lot of money from the stand-point of free membership, but that is probably better than no club at all for amateur radio in two or three years.

Much teeth gnashing can be caused by the Control Station bylaw. The question is, just how do corporations handle this multi-headed monster of a person acting in behalf of the Trustee who in turn is designated with responsibility of the corporations interests? Catch on to that snakey deal. The Trustee is appointed by the club. Every thing he does is in accordance with the FCC rules and regulations. That includes appointment of the control stations. The event of a control station making quantities of boo-boos and getting cited more than once must be covered in the bylaws. Such a bylaw may make it difficult to get volunteers to act as control stations, but that simply is the breaks of the game and another reason to write your Congressman about the unreasonableness of the FCC. To remove a control station and add a new one costs $8.00. Cannot allow that to happen too many times in any one club.

A similar problem area covered in the bylaws is concerned with fines and litigation. Hopefully, no repeater group will ever get into a four way lawsuit. This would be a simple case of perhaps profanity or broadcasting, and involving some user of the corporations equipment, the Trustee, a control station, and the Feds. The Federal rules and regulations seem to put the monkey on the Trustees back, but in reality, it will always be the user who will actually committ the violation, and do so quickly in a manner that the control station doesn't have time to hit the kill button. Simply, the corporation here is not ready to pay some one's fine. The corporation was not organized to protect the hard case or semi-nit wit, but to enable operation of a repeater.

It has already happened here and likely has in other places. The circumstance was a cold winter day and a hard to start auto. The unknown subject apparently had two radio equipped autos, and had the woman of the house, likely unlicensed, operating the vehicle in tow. Needless to say, when she did not operate the brakes at the proper moment, there was much profane advice and directions given.

All the luck in the world to you and yours in your Repeater Government.

...W5OJZ

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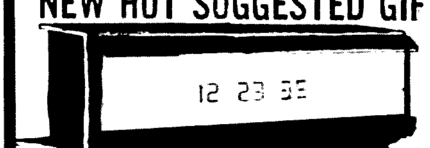

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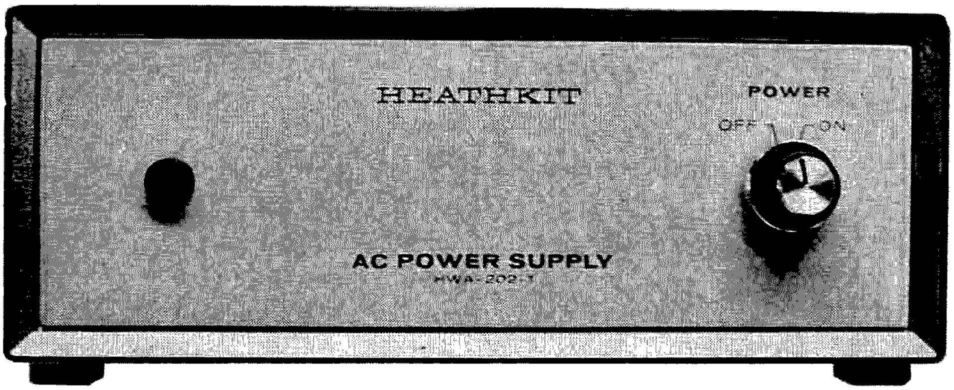
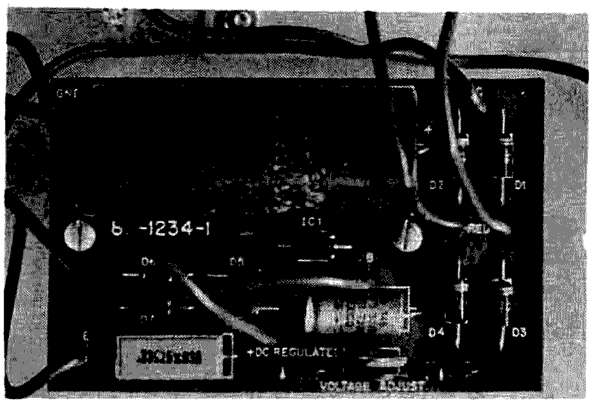
THE HEATH



HWA-202-1 AC Power Supply

The HWA-202-1 power supply is intended for use as a companion unit for the Heath HW-202 2 meter FM Transceiver when that rig is operated at a fixed QTH where ac power is available. However, the features of this supply also make it a very fine general duty, 12 V, 2 ampere source for operating miscellaneous solid-state receivers, converters, amplifiers or experimental circuits on the bread board.

Output voltage is internally potentiometer adjustable from 10 to 15 V and is completely regulated within 1½% from no load to full load (2.2 amps). In addition to conventional circuit breaker protection, the unit is electronically protected from current overload (short circuit) by the integrated circuit sensing arrangement which is the heart of the regulator circuitry. Voltage from the ac plug up to the dc regulator is a conventional transformer-diode bridge rectifier capacitor filter circuit. . .but between this point and the output connector is a large regulator transistor whose emmitor – collector path is in series with the power supply's load. The base of this transistor is biased by the IC output which is determined by its comparing a zener diode referençe voltage with that of the output voltage.



This Photo shows diode D4 with cathode band painted on wrong end.

Assembly of the kit is very simple and can be accomplished in less than 2 hours. Most of the components are mounted on a small etched circuit board and this accounts for the rapid assembly.

Upon completion of my power supply, I plugged into a nearby ac receptacle, placed the unit's power switch to the ON position. . .and promptly popped the circuit breaker. This bordered on discouraging. I rechecked the wiring. Nothing. I checked for cold or bridged solder joints. Nothing. I checked the marked polarity of the electrolytic capacitors and diodes. Looked OK. I rechecked the wiring. Nothing. I unsoldered the transformer leads and measured resistances in a search for shorted windings.

Checked OK. I rechecked the wiring. Nothing. I removed the regulator transistor and made emitter to base and base to collector resistance readings. Read OK. I rechecked the wiring. By now the power supply was almost back in the unassembled condition that I had started with two hours earlier! Finally, while checking the front-to-back resistance of the diode rectifiers, I discovered a curious thing. . .one of the diodes had the *cathode band painted on the wrong end!* After turning the diode around (and reassembling the power supply), everything worked as advertised. In all of my years in electronics, this was the first time that I ever encountered a mismarked component, and it was certainly not the fault of the Heath Company, but it is something to look for when almost all else fails.

As a final check prior to placing the unit in service, I connected an oscilloscope to the output leads and, with the vertical sensitivity at .05v/Cm, was unable to detect any ripple component of the dc voltage. Under load, using an HW-202 in the transmitting mode, less than 10 millivolts peak-to-peak ripple was observed, which for practical purposes is negligible.

Priced at $29.95, the HWA-202-1 rates a "good buy" as an accessory unit for the HW-202 transceiver, which it matches in size and style, and as a well regulated 12 V source for the ham shack.

. . .W3WTO

HOW TO BE SURE THAT HAM RADIO HAS A FUTURE

Gabe Gargiulo WA1GFJ
17 Whitney Street
East Hartford CT 06118

The best way to protect something is to get someone powerful to look after it. The fact that you, the ordinary person, want to safeguard amateur radio means nothing. The only way to guarantee a future for ham radio is to get business behind it. Look at what the electronics manufacturers are doing to keep and expand CB!

Big business is not going to care one hoot about ham radio if you tell it how great and wonderful ham radio is, or what worthwhile things are accomplished on the air. They will begin to care only if the outlook is good for profit.

Yes money – the root of all evil. That is what will make company presidents sit up and ask, "What in hell is ham radio?" If they realize that there is money to be made on the hobby of those crazy nuts, they will take pains to protect it. Money will be spent to influence legislation on our behalf. Subtle pressures will be felt by government officials at all levels. Better yet electronics manufacturers will continue to produce ham gear at competitive prices. They will promote ham radio and introduce young people to it. All this will expand the hobby and cause it to grow.

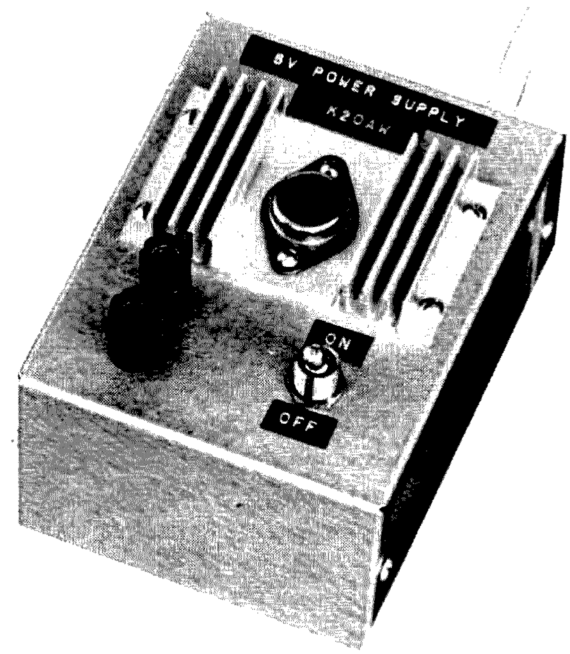
Nice – but it won't happen unless some money starts to flow into the treasuries of the makers of ham gear. This means that you, Joe Ham, must get out and *buy*. Purchase ham gear. Buy new equipment. Don't spend your money on cigarettes. Forego the luxury of a new air-conditioned car. Instead, buy a quad and a 40 foot tower.

Buy! Buy new transceivers, receivers, transmitters, antennas. Get into two meter FM and ATV. Get that scope you always wanted. When your wife asks where all the money is going, tell her that it is to insure that ham radio has a future, and to protect your investment in all that expensive equipment. Remember, you aren't wasting money or indulging yourself – you're only protecting your investment. Besides, you're helping to creat jobs in the electronics industry.

How can you resist now, knowing all the benefits of buying more radio gear? Just thumb through this magazine and you'll find page after page of luscious goodies just waisting to be bought. Protect your investment. Be sure ham radio has a future. Buy. Buy. Buy.

. . .WA1GFJ

Peter A. Stark K2OAW
P. O. Box 209
Mt. Kisco NY 10549



A Simple 5V Power Supply For Digital Experiments

Now that some 7400-series TTL (transistor-transistor-logic) digital integrated circuits are available for as low as 20¢ apiece digital projects are getting more popular among hams. Here's just the right power supply to make your digital experimenting easier.

As shown in Fig. 1, the supply consists of a simple bridge rectifier, fairly heavy filtering with two 2200μf electrolytics, and regulation with an LM309K integrated circuit regulator. As shown in the photos, the LM309K is mounted on an aluminum heat sink right on the case (the ICs case is grounded so no mica insulators are needed). With such a heat sink the circuit will provide up to 1a at 5V. With the IC mounted just on the case, but without a separate heat sink with fins, the maximum current output will be somewhat less, but probably still above ½a.

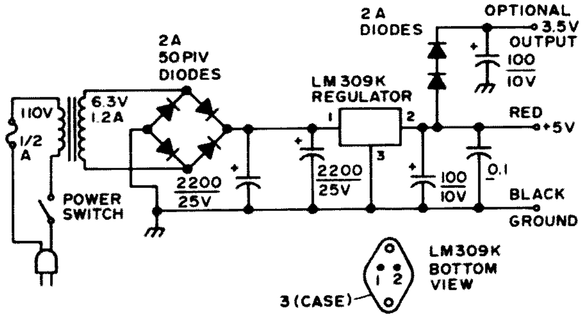


Fig. 1

The secret of the circuit, of course, is the regulator IC. Not only does it provide excellent regulation and practically eliminate any ripple on the output, but it is also short-circuit proof – you can short the output of the supply and no harm will be done. It also shuts itself off in case its temperature gets too high, in other words, no damage will be done if you skimp on the heat sink – you just get less output current before it shuts off.

The 5V output is perfect for 7400-series and other TTL ICs, as well as most DTL and ECL circuits. Since RTL ICs need only about 3.6V, you can add an optional output for these ICs by just adding two diodes and one more electrolytic.

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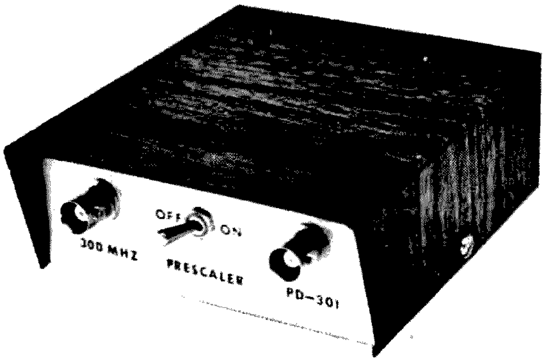

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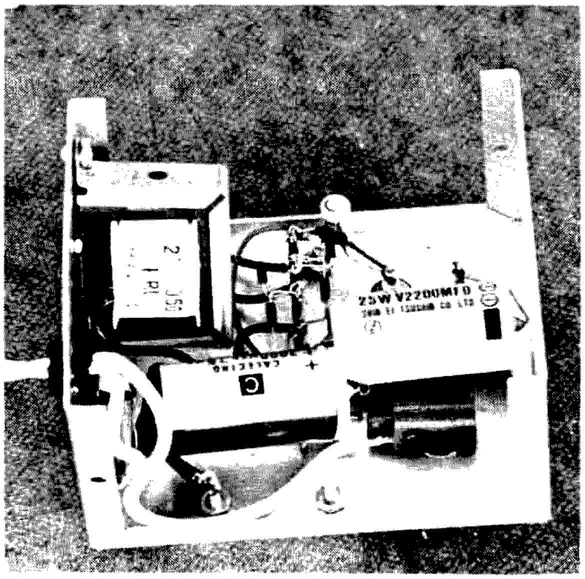

Fig. 2. Inside the K2OAW power supply.

To reduce power supply feedthrough of logic signals from one circuit to another, place the 100μf and 0.1μf capacitors as close as possible to the two output terminals, and use short leads. In addition, don't forget that TTL ICs generate very short spikes on their power supply lines, and therefore you will need additional bypassing inside your circuitry itself. Every four or five ICs (at the most) should have their own 0.1 or 0.01μf disk capacitor connected directly from the +5V line to the nearest ground, using the shortest possible leads. These additional capacitors should be as close to the ICs being filtered as possible. In really severe cases, you may have to connect these capacitors right at each IC.

Chances are good that you won't need a bigger supply than this; we've used it to power a frequency counter with over 30 TTL ICs which only took slightly more than ½a. Not many projects will ever need more than 1a. But if you do need a bigger supply, don't try paralleling the LM309K regulators to increase their current capacity, since they will not share the current equally. The best bet would be to make several separate supplies, which share only a common transformer, rectifier and brute-force filter (at least 4000μf per ampere). Each output would then be separately regulated, and would drive a separate part of the circuit.

. . . K2OAW

F. H. Ryder VE1AIL/GT
Bsc M. Eng. P. Eng.
(M) IEEE C. Eng. FIEE
VE1AIL, VE1GT, XM65-2239

THE WET NET

The Saint John River rises in the State of Maine, and flows half of its total length northward to the very tip of Maine, then turns southward and flows through the west and central part of the Canadian Province of New Brunswick.

There are no flood control dams on the Saint John River in northern Maine, a conservationist's paradise, and consequently, by the time a large rainfall in Maine reaches New Brunswick, little can be done except "run for the hills." This can be done quite easily on most stretches of the river, with one exception; just east of the capital city of Fredericton, the northern bank of the river flattens into a flood plain which forms the market garden area of central New Brunswick. Slightly more than 1000 dwellings and about 150 farms are located in the 40 mile stretch of interval land. Most years the St. John River floods its banks and gently submerges the area. When the water subsides the further enriched thick black soil will grow most anything – fast!

On the last weekend of April 1973 such a gentle innudation was taking place, however, in Northern Maine and New Brunswick the equivalent of an additional eight inches of water lay in the woods in the form of snow. On Saturday, April 30, Northern Maine and Northern New Brunswick experienced in the order of 2½ inches of warm rain which would have been bad enough in itself but it also melted the snow and to repeat a famous saying, "then the fun began." Within four days, the previously recorded record flood level in Maugerville – Sheffield set in 1887 was exceeded by some three feet and previously accepted levels of preparedness for flooding were proven to be inadequate.

The Emergency Measures Organization (EMO) here in Canada has of recent times been giving more serious consideration to civil emergencies of reasonable magnitude and probability. In early 1973, the New Brunswick Amateur Radio Association was asked to define what sort of communications capability could be provided in an emergency and in due course a brief was prepared and presented to EMO.

Little was it then realized that less than three months after completing that report, it

would form part of the discussion papers during the organizational meeting of a massive flood rescue and relief operation.

The Flood Forecasting Task Group is a joint effort of Federal and Provincial Departments of the Environment and N. B. Power, an electric utility with hydro generating stations on the river. This year the task group was located in an office of N. B. Power and fortune dictated on that wet Saturday evening that I visit the task group and come upon the organizational meeting of the rescue operation. In due course, the opportunity was given to define once again the services that could be provided by Radio Amateurs and within one hour the "Wet Net" was in operation on 80 meters with VE1TC, BM and ACA alternative as net control and on two meters a station was set up in one of the N. B. Power offices taken over by EMO for the emergency operation; this gave us a completely independent communications link with the EMO office should the telephone circuits become inadequate.

It was emphasized to EMO officials that our automatic repeater VE1GT gave solid coverage of the low lying area and that we could assure direct communications with their field staff anywhere in the area. As a test of this VE1AJT (now AKT) a hand held unit was dispatched with a helicopter patrol unit early Sunday morning and provided the EMO official doing the patrol with communication *directly* with his confreres in the office.

On Sunday morning the record flood was still only a forecast and the water in Maugerville – Sheffield was as yet some feet below previous record levels. A road patrol was then mounted using a large utility vehicle, with VE1AEK, (now HL) in operation.

N. B. Dept. of Agriculture representatives were on board and the purpose of the patrol was to advise each farmer of the impending increase in the water level and to evaluate the situation of each so that subsequent rescue operations would be as effective as possible. The patrol barely made it back, with water well up on the tires and sitters on the front fenders peering down through the water to ensure that the driver stayed on the road.

The rest of the day was spent in preparation for rescue by means of scows, barges, ferries and military amphibious vehicles.

There is a saying "Nothing like good service is so effective in increasing the demand for that service." I won't say how good our service was but we began to get swamped with demands. Hand held units were required on board the rescue craft and base stations were required at the marshalling points where livestock was to be transferred to transport trucks. This was obviously beyond the resources of Fredericton Amateurs and a call for two meter equipment and operators for 24 hour a day operation was made on 80 meters. And did it come? You bet! A contingent of 9 from Saint John led by Ken VE1AVA and one of 6 from Moncton area led by Ron VE1SH and Reed VE1NU, who brought walkie-talkies, Don VE1DK came 300 miles from Truro, Nova Scotia to lend a hand; this gave us a total of 33 operators. Ken and Ron covered the marshalling points at Burton, across the river from Maugerville and the others manned the boats. The object being that anyone requiring assistance could get it with the least possible delay. A battery of telephones had been installed in the EMO temporary headquarters and from this co-ordinating centre rescue craft were dispatched from the Burton marshalling point by amateur radio. The net also proved of value to the rescue craft when one got both propellors tangled in a barbed wire fence and another lost its engines and grounded.

I would be remiss in not mentioning the part played by the several GRS (CB) clubs in support of the operation. Base stations were in operation both at Burton and the EMO Headquarters on a 24 hour basis and many CB equipped small patrol boats made reports of conditions. Many of the transport trucks hauling livestock were CB equipped and were more effectively dispatched than would otherwise have been possible, particularly as the scows would often miss their scheduled landing wharf and be swept downstream to the next one. Much co-ordination was needed to get the trucks and the scows to the same wharf.

The rescue operations were complicated by the fact that to reach the barnyards

Rescuing a reluctant cow.

rescue craft had to cross over the highway, covered by only 3 to 4 ft. of water and consequently, only very shallow draft vessels were of use. The operation continued through Monday, Tuesday and Wednesday, dawn to dark; navigation on the river after dark was too risky.

Government offices and the legislative buildings also suffered from the flood, and we soon found that the Premier's temporary office was just down the hall and he, as well as various ministers, came in from time to time to inquire about various things and were briefed on the role of amateur radio in the emergency effort, in addition to getting the answers they came for.

On Tuesday night the 200 prize cattle of Gerald Hoogendyk stood on dry land with a foot to spare. On Wednesday morning, they stood in icy water belly high when the Second Field Artillery came to take them out. By now these cows were in panic and the sound of roaring motors as the soldiers executed an aquatic roundup was drowned out by bawling cows and calves. Often the men were obliged to jump into the icy waters to assist an animal to get on board the scow. At Waterbury's farm, having rescued the 30 cows from the corral, one brave lad went in to get the 1800 lb. bull and was promptly thrown out through the fence. Doug Nielson, the EMO Rescue Coordinator, 6'4", 200+ lbs, then went in and after running the bull around the corral several times made for the scow. Both he and the bull got on all right but couldn't get stopped; two cows and several soldiers were pushed right over the other end of the scow. A helicopter patrol later reported seeing a scow crossing the river with 30 cows and a group of soldiers crowded up in one end while a large bull glowered at them from the other.

At Henry Shuttenbeld's farm, there was another problem of slightly different dimension: 300 pigs, and time was of the essence in this evacuation because pigs can't stand cold water very well. It was the same thing all over with the action speeded up to almost comic proportions to the tune of the high pitched squeal of the pigs.

Communications by now had been worked down to a simple routine, with operation on 94 simplex between the rescue craft and Burton, and via VE1GT for other operations. On Thursday morning we were advised by EMO that since things were now tapering off they wished to rely on the commercial and military communications systems for the balance of the Maugerville – Sheffield operation.

The crest of the flood was now proceed-

ing towards the City of Saint John on the south coast of New Brunswick and both the EMO and the radio amateurs turned their attention to this city, 70 miles south of Fredericton. The Saint John EMO office had limited telephone access and this was soon jammed so the two meter station of Dick VE1ATG was set up and a relay maintained through the 80 meter Wet Net. Phone patches proved useless because of jammed phone lines but a 2 to 80 meter patch made by alternately holding speaker to microphone enabled a direct relay at one point when such was needed to precipitate action.

By Friday noon, the danger of further flooding was passed and all amateur operation in support of EMO ceased.

To emphasize the magnitude of the operation, some 1500 people were temporarily relocated and 1200 cattle, 400 pigs and 20 horses were rescued with the loss of only four and with no loss of human life or major injury.

In conclusion, there are several observations on emergency communications that can be made on the basis of this operation:

1. The amateur is there to provide a communications service and not to involve himself in the operation, that's the problem of the emergency officials. Just pass the traffic and give them direct access when they need it to sort out a difficult problem.

2. The most ineffective repeater has a pair of ears and a mouth. Traffic handling is one area where hams as well as CBers alike fall down; for this reason, and my observation that emergency officials seem to prefer to be able to talk directly to their counterparts, I recommend that when such a need is evident HF-VHF and CB patching be used where repeater links do not exist.

3. Frequencies and repeaters used in the emergency must be kept free of chatter. It gives a terrible impression unless the stations interfacing with the emergency organization uses earphones and net control quiets everybody down while the emergency officials are at the mike. This is hard to do on VHF, worse on HF and well nigh impossible on CB.

4. Patrol vehicles must report what they see, without assumptions, or opinions, and do it briefly, clearly and slowly. Many a wild goosechase has been precipitated by the embelleshment of report. Checking up on such reports is easier to do when the reporters can be grilled directly rather through a number of relay stations.

5. It is my opinion that in subsequent emergencies of this magnitude the use of VHF and repeaters is a must. Means must be found to erect temporary repeaters during such emergencies in areas not permanently served and to link them on VHF full time or patch them on HF when necessary, to the emergency control centre. HF has its place for long distance communications and should not be cluttered up with local communication activities. CB has the advantage that there are many portable and hand held units in service today but range must be limited to distances such that the desired signal will not be swamped in the ever present interference.

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THE GDO AND THE VOM...GREAT! –BUT DON'T OVERLOOK THE XYL!

Robert J. Shebal W8ZKL
306 Potawatomi Blvd.
Royal Oak MI 49073

Every ham is familiar with a few of the more common tools of the trade such as the VOM and the GDO. But I often wonder how many realize what an invaluable but often overlooked accessory the XYL can be . . .

Even though she may not have a ticket, used properly, she may fill the void in the shack and make your operating more pleasurable.

As a for instance, let me relate this lovely incident that occurred at this QTH. Perhaps it will bring a lump to your throat. A definition of love and true affection could not be more dramatic, and if it brings a tear to your eye, it just proves the point.

It was a typical Wednesday evening with the sweet little thing in the living room, eyes glued to the Wednesday night movie on the mahogany knothole. Meanwhile, back in the shack, I tuned for some rare DX that was coming through on twenty meters. Suddenly to my horror the rotor quit on me and naturally in a direction away from the DX. The beam refused to budge.

I rushed upstairs and explained my plight to the XYL, but she refused to leave the movie. Later, during a commercial, she agreed to help. Almost the same instant a flash of lightning and a clap of thunder rattled the house.

Undaunted, she donned her lineman's belt, and at that precise moment – I was so proud of her – she began her ascent up the four inch pipe mast After all, she weighs only one hundred pounds, and the lineman's belt with cutters, pliers, hammer, small crowbar, 25-foot roll of RG8U and a few other things she needed, weighed forty-two pounds.

I watched her as she shinnied up the pipe and I could see her quite well during the lightning flashes, and between rolls of thunder I could hear the rattle of tools as they dangled from the belt.

She yelled at me to turn on the flashlight and shine it at the top. She really didn't need the light to find the top, because the only way to the top was up. Anyway, she knew the way, as she had climbed it many times before. Apparently she was not aware of the price of flashlight batteries.

It had begun to rain quite hard, and I yelled at her to get a move on up there because I was getting wet. She had finally reached the top and yelled down for some light. I told her the lightning was so frequent that she could work during the flashes.

She got excited and dropped a hammer that almost hit me on the head. I told her that for being so careless and since I was getting wet, I was going into the house and dry off. As a nice gesture I watched the end of the movie so I could tell her how it ended as I was sure she would want to know.

When she came in the house she refused to talk to me just because I had yelled at her while she was up on the mast. She wouldn't even listen when I tried to tell her that the movie ended with John and Marcia getting a divorce because John was very mean and unreasonable.

What I originally started out to say is simply that the XYL can be a valuable addition to the shack, although at times they can be a bit difficult.

Since she is still a bit miffed, please don't show her this article. Better yet, I wish this would self-destruct after you read it.

. . .W8ZKL

Earl C. Dunn, Jr. W5LCT
9634 Paula Drive
Corpus Christi TX 78910

SELECTIVE CALLING

(remote activation via FM)

If you are a member of an organization that operates a busy repeater, chances are you monitor the machine only while mobile. At home, the nearly constant conversation is just too distracting. For instance, it interferes with the great old American pastime – TV watching, not to mention that the wife/children/mother-in-law may take exception (sometimes violently) to the "noise." However, it would be nice to receive those calls addressed to you and perhaps special bulletins or announcements – hence *Selective Calling.*

The availability and use of various tone pads for autopatch/repeater control provides a common encoder on which to design such a system. Since tones produced by the "pads" are universally common in a standardized frequency format, only the decoder requires alignment. Assuming your local repeater is equipped with autopatch some or most of the members will have already connected pads in their mobiles.

The design of a decoding device for use at home (or in the mobile) requires consideration of several factors depending on local conditions. First, and most important governing consideration, is the number of discrete calls (addresses) that will be necessary to accommodate the amateurs desiring personal decoders. This consideration will determine the complexity of the decoder since the encoder (tone pad) can produce a vast number of combinations. Second, consideration should be non-interference with the access code of the autopatch. The third objective could be to prevent false activations caused by telephone number combinations. If twelve button pads are in universal use and the autopatch does not employ * or # for access, then the last two objectives are easily accomplished. Actually an access code of four numbers that in effect "tests" the pad by requiring that all seven of the tones be correctly transmitted in order to seize the telephone line is a highly desirable situation, anyhow.

Decoding the dual-tone combinations is done quite simply using the NE567 (Tone Decoder) and the required NOR gates (7402). One NE567 is required for each tone, so it would be necessary to utilize

seven NE567 if the full pad is to be decoded. The decoder presented decodes four of the dual tone combinations with four NE567.

The particular logic to be presented is designed to require four digits in proper sequence within a defined time period and will not accept (for simplicity) two digits side by side – such as XXYY, but will accept XYXY. The mathematical possibility exists for a total of 108 (4.3.3.3) combinations. For example, choose 7, 9, *, and # to be decoded and this is one of the four 27 combination formats.

79#*	7#9*	7*9#
79*#	7#*9	7*#9
79#9	7#*#	7*#*
79*9	7#9#	7*9*
797*	7#79	7*79
797#	7#7#	7*7#
7979	7#7*	7*7*
79*7	7#97	7*97
79#7	7#*7	7*#7

Development of the total combinations (above and Table 1) will reveal two which are all numerals (7979 and 9797) and these can be discarded since they may be part of a telephone number. Also, there are two combinations of no numerals (*#*# and #*#*) which can be reserved for the use described below. Therefore, a repeater group of 104 can be assigned individual addresses. The no numeral combinations can be decoded by all or a portion of the members and used – for example, as net call, emergency reaction group, board of directors net, or any other special purpose. This use of these combinations is important if the system requires expansion. A study of Fig. 1, will reveal that simply moving the 852 Hz decoder to 770

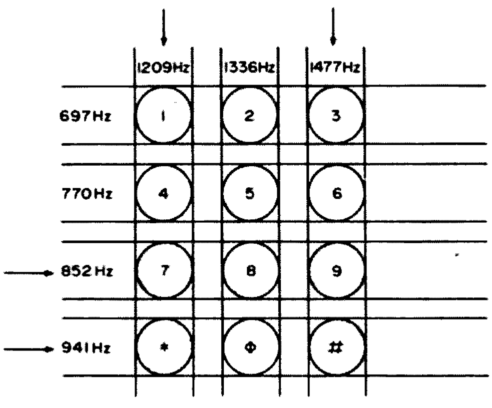

Fig. 1. Tone pad.

97#*	9#7*	9*7#
97*#	9#*7	9*#7
97#7	9#*#	9*#*
97*7	9#7#	9*7*
979*	9#97	9*97
979#	9#9#	9*9#
9797	9#9*	9*9*
97*9	9#79	9*79
97#9	9#*9	9*#9
#*79	#79*	#97*
#*97	#7*9	#9*7
#*7*	#7*7	#9*9
#*9*	#797	#979
#*#*	#7#9	#9#*
#*#7	#7#7	#9#7
#*#9	#7#*	#9#9
#*9#	#79#	#97#
#*7#	#7*#	#9*#
*7#9	*9#7	*#97
*79#	*97#	*#79
*7#7	*9#9	*#9#
*797	*979	*#7#
*7*7	*9*9	*#*#
7#	*9*7	*#*7
*7*9	*9*#	*#*9
79	*97*	*#9*
7#	*9#*	*#7*

COMBINATIONS TABLE

Hz will substitute 4 and 6 for the example 7 and 9 providing an additional 104 combinations still retaining the common no numerals (*#*# and #*#*). Moving the same decoder up to 697 Hz substitutes 1 and 2 thus producing another 104 discrete addresses. The total capacity is 312 individual calls which should satisfy most requirements. Additional combinations are of course possible by adding additional digits and by using pure number combinations.

The digits (decoded dual tones) must arrive in proper sequence and the last digit must arrive within a time limit (2-3 seconds – adjustable) after the conclusion of the first one. An initial digit (logic 1 from the 7402) is applied to the first monostable multivibrator (74121). The conclusion of the tones causes the M/V to begin timing and the $\bar{Q}$ output goes low (logic 0). This frees the first reset-set (R/S) flip flop so that digit two causes it to reset (pin 13 goes low). Now the third digit will reset the second R/S flip flop (pin 4 goes low). With this condition the A input of the second M/V is low and the receipt of a fourth digit initiates its timing cycle. This M/V remains on for about

20-25 seconds while driving the NPN transistor to conduct and close the relay. Contacts of the relay connect the speaker allowing reception of the incoming call. A portion of the last tones transmitted will also be received through the speaker to alert the called party. The manual override is then activated by the operator for normal operation and returned to automatic after the conclusion of transmissions. Fig. 2 depicts the above described logic arrangement to decode any one of the four digit combinations. As already mentioned, if the fourth digit does not arrive before the first multivibrator automatically clears, then the second 74121 cannot begin its timing cycle. This delay time can be extended by changing the 100μf capacitor to a higher value.

Fig. 3 is an example of a four tone decoder with logic output. The interconnecting lines can be translated to a PC board layout if the dashed lines are considered to be jumpers (or the top face of a double sided board). Another construction technique is the use of perforated board and "Circuit-Stik" copper strip interconnects and IC pads. "MOLEX" socket pins provide inexpensive mounting for the ICs. Each NE567 decoder uses the same external com-

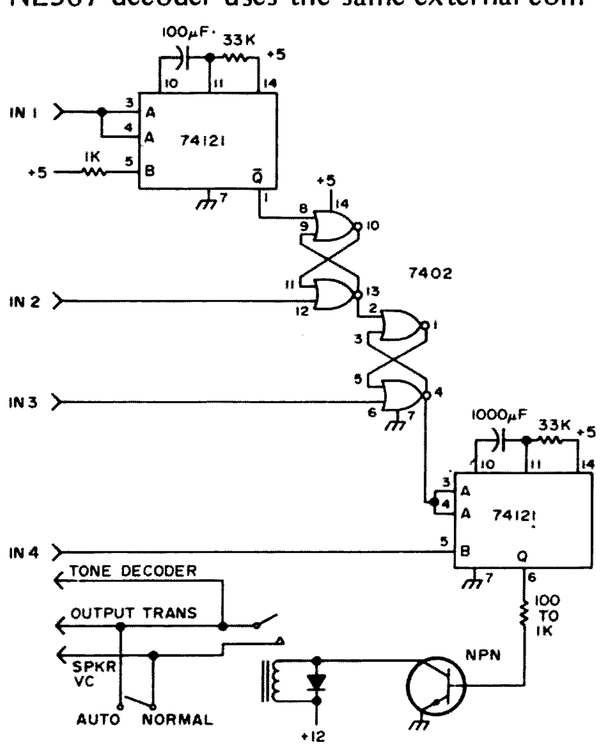

Fig. 2. A control logic arrangement to decode any of the four digit combinations in Table 1.

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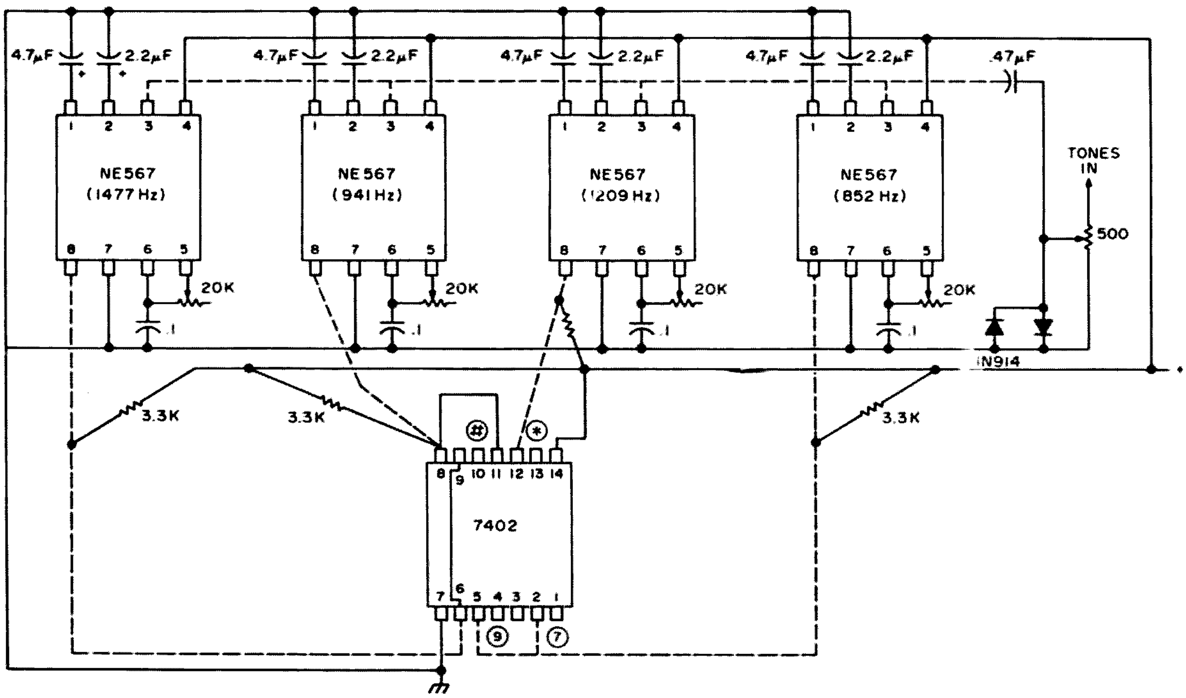


Fig. 3. Tone decoder.

ponents and the frequency is determined by the setting of the 20K mini-pot. The .1 μf capacitors should be mylar for frequency stability of the decoder. The electrolytics need only a 10/15V rating. Tune-up consists of injecting proper single tone at input (many pads will produce a single tone if two adjacent buttons are pressed simultaneously) and adjusting pot on corresponding NE567 for a pronounced dip in voltage as measured on pin 8. Tone input should be 100-200mV and can be obtained easily from the speaker side of the output transformer with level being adjusted by the 500Ω input control. It is not too critical and the 1N914 diodes should protect the ICs from excessive accidental input levels. The NOR gates (7402) combine the outputs of two associated decoders to produce a high (logical 1) at the indicated output pin.

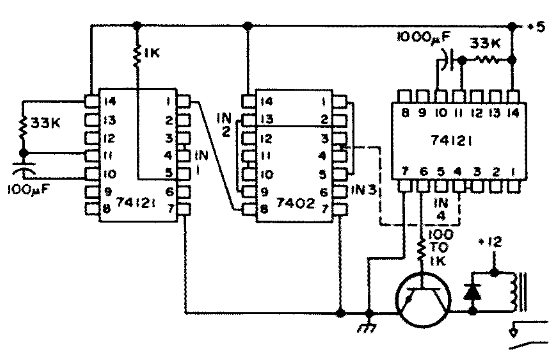


Fig. 4. Control logic.

Fig. 4 is an interconnect of the logic and control transistor which may again be translated to a PC board or other layout. A typical power supply to provide 5V regulated for TTL ICs and 12V for relay is shown in Fig. 5. Eliminate transformer and rectifiers for mobile applications as appropriate.

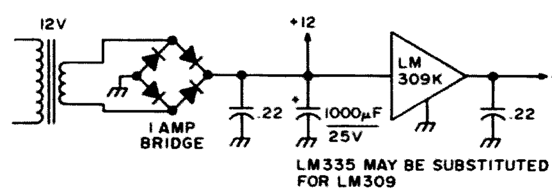


Fig. 5. Power supply.

There are numerous additional possibilities for this control system. For instance, a tape recorder could be incorporated to provide a means for "leaving messages" in case the called party is not immediately available. Relay contacts could start and stop a simple tape machine using its remote microphone contacts. If an on time of longer duration is desired the output M/V can trigger an inexpensive NE555 timer which can be set for long delays. Also, if your group transmits a periodic bulletin, the net call can be transmitted prior to announcements for activation of speakers/recorders.

. . . W5LCT

73 STAFF

REMOVABLE VHF/UHF MOBILE ANTENNAS

There may be many reasons why one would prefer to have a readily removable 2m or other VHF/UHF band antenna on one's car. Such an antenna should, however, be electrically efficient, sturdy enough for usage while driving at turnpike speeds and yet not require any drilling or other marring of the car's surface. Some commercial antennas are available which partially fulfill these requirements. Usually they use a lip type mount and are meant to be placed around the trunk area on a car. But, there are a number of possibilities for the amateur to construct for himself sturdy and economical mobile antennas of the removable variety. This article describes two such possibilities – one in general terms and the type which the author found best in specific detail. The ½ and ¼ λ dimensions which are given apply to the 2m band but these dimensions can be those necessary for any VHF or UHF band.

It may seem at first glance that there should not be much involved to building a simple ¼ λ antenna which mounts, for instance, in a temporary manner on the rain gutter of a car. But, as I found out after many hours of experimentation, there are a number of precautions which must be followed if a really useful antenna is to be constructed. The precautions are not complicated in nature but this article does condense many hours of work concerning both the mechanical and electrical details of constructing a suitable antenna. If followed, the guidelines contained in this article will result in the construction of an antenna providing excellent results on 2m or any other VHF/UHF band.

Where to Mount the Antenna

The best position to mount a mobile antenna is generally the same as for a fixed station antenna. Namely, as high and as in the clear as possible. In the case of a car, this would mean in the center of the roof. A removable antenna can be mounted in such a position without damaging the car's surface by means of a luggage rack holder. A 5/8 λ base loaded antenna mounted in the middle

of a luggage rack holder with the transmission line coming in by one of the car doors, will provide excellent results. But, the installation is certainly unsightly and would not meet any reasonable definition of a readily removable mobile antenna.

Another possibility is the use of a 5/8 λ whip held to the car's roof by means of a magnetic mount. Such antennas can be very efficient but usually the construction of the magnetic mount for the home-brewer is both too complicated and expensive. This is especially true of such a mounting which one would want to depend upon as staying in place under turnpike speeds or when light foliage strikes the antenna itself.

The other possibilities to provide a secure mechanical mount for an antenna while still keeping it as high up as possible on the car, are either a side window type mount or a rain gutter mount. Neither such mounting position places the antenna in the center of the car's roof so there will be some directional effects associated with such mounting positions. But, the directional effects are still less than if the antenna were located still lower on the car's body.

Side Window Mount

One can form a metal bracket which conforms to the dimensions of a side window and slips over the top of the window much like a giant tie clip. The window can still be rolled up fully if the clip fits snugly enough over the top of the window. The outside surface of the clip supports the antenna mounting terminals (insulated from the metal surface of the bracket) and the feedline from the base of the antenna passes through one of the car doors. But, such an antenna must be independent of any ground connection to the car. This is not as impossible as it sounds. Fig. 1, shows the electrical diagram of such an antenna. It consists of a ½ λ vertical radiator connected directly to a 52Ω coaxial transmission line via a 20 pf variable capacitor. The shield of the coaxial cable at the antenna end need *not* be connected to the car body. The ½ λ vertical radiator usually has to be bent a bit sideways and then vertical in order to clear the rain gutter on a car. Once mounted and tuned correctly such an antenna will provide very good performance.

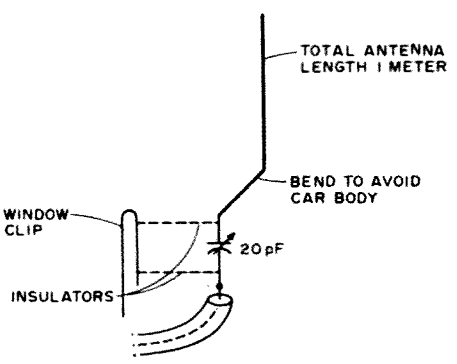


Fig. 1. Window mount ½λ antenna. Coaxial line shield is NOT grounded at antenna base.

Antenna types of this sorts have been marketed and used successfully in several European countries for a number of years for both commercial and amateur radio services! The commercial versions mount the variable capacitor in a plastic housing (which also supports the antenna) on the outside of the window clip and the entire assembly produces a relatively compact and neat appearance. Besides the foregoing, the advantages to the antenna are that the variable capacitor need only be adjusted for the lowest SWR on the transmission line to the transmitter. The disadvantages are that the electrical performance of the antenna is no better than a ¼ λ whip mounted in the same position with a ground connection to the car's body. Also, the adjustment of the variable capacitor will only hold true if the antenna is remounted always in the same position on the car. If mounted in a different position from that for which it was originally tuned (from a front side window to a back side window, for instance), the different reflecting plane the antenna sees will require readjustment of the series capacitor for lowest SWR. A somewhat less disturbing disadvantage is that the transmission line for the antenna must be routed around one of the car doors and either be disconnected at the antenna, or at some intermediate point on the transmission line, when the antenna is removed from the car's window.

I found that the antenna mounting scheme described next was easier to construct and adjust for a temporary mobile situation. However, the ½ λ radiator just described does have a number of possibilities

for *portable* operation which some amateurs might wish to develop further. The lack of a requirement for a ground connection at the antenna end of the antenna transmission line makes it particularly attractive for such usage and it is a proven commercial design.

Rain Gutter Mount

The rain gutter on the side of a car provides a convenient mechanical supporting point for a temporary mobile antenna. To place a ½ λ antenna, such as that previously described, on a mounting which secures to the rain gutter at one point would probably place too much mechanical stress on the mount. This is particularly true for a 2m antenna. However, if one can develop a good ground connection at the point at which an antenna is attached to the rain gutter, the antenna mount need only support a ¼ λ antenna. The electrical diagram of such an

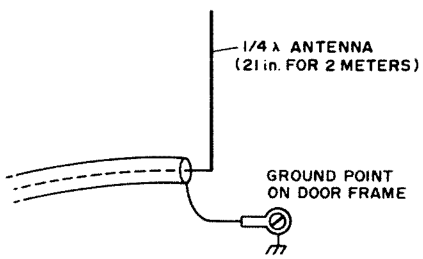


Fig. 2. Electricial diagram of gutter mount ¼λ antenna.

antenna mounting is shown in Fig. 2. The advantage to such a mounting scheme is that the antenna needs to be only ¼ λ long and, therefore, can be made to be quite sturdy mechanically. Also, since the ground point is fixed, the antenna can be removed or placed on the rain gutter at the *same* point as often as desired without any effect upon the transmission line SWR. There is no series capacitor or other tuning reactance needed at the base of the antenna and the mechanical construction of the antenna mount is greatly simplified.

The key to taking advantage of this antenna mounting scheme is to find a point on the rain gutter of a car to which a transmission line can be run and a good ground connection made for the shield of the coaxial transmission line just before the cable reaches the rain gutter. The requirement sounds more difficult than it really is in practice. If one examines the moulding around the doors on most American cars, there will be found to be a number of points where one can secure a good ground connection and run a coaxial cable inconspicuously to a good mounting location for a transceiver or power amplifier. Fig. 5, shows how I mounted a ¼ λ antenna on the rain gutter (forward passenger side) of a standard Pontiac sedan. The coaxial transmission cable was brought from a 2m power amplifier (mounted behind the glove compartment) underneath the forward side window frame moulding (easily removable by two screws) to the space between the door and the door frame of the car body. There were several screws used to secure flashing to the door frame of the car body where the coaxial cable emerged at the top of the door. One screw mounting nearest the top of the door was used to ground the shield of the coaxial cable via a ground lug after the screw and the hole in which it sat were cleaned with a file to insure a good metal to metal ground connection. These types of screw mountings can be found around the door frames of any car although the location will vary with car makes and models.

Once the shield of the coaxial cable was grounded about a 7.62cm length of the inner conductor (with insulation) was left to connect to the antenna when it was temporarily attached to the rain gutter. When the antenna was removed from the rain gutter, the 7.62cm length of inner conductor was just run along the inside upper edge of the door frame and remained completely inconspicuous. The 7.62cm length of unshielded cable does become part of the radiating portion of the antenna but this effect is minor on the VHF and lower UHF bands.

Mechanical Details

A rain gutter mount can either be purchased or easily homemade. If one can obtain spare parts for a car top luggage carrier which utilizes a support connection to the rain gutter, one need only purchase such a single accessory support and turn it into an antenna mount. The form of such a mount is the same as that of the homemade support to be described which, in fact, was

copied from a commercial luggage rack support.

The homemade support can be easily constructed from hand tools and is made of .32cm or .48cm thick aluminum stock. It consists of two pieces – a T shaped main support and a clasp which goes around the rain gutter. The dimensions for these two pieces plus how they assemble together to mount on the rain gutter are shown in Fig. 3. The two pieces are held together and tightened to the rain gutter via a bolt passing through both pieces and a wing nut. This arrangement provides a tight mount as well as one which is readily removable without any tools. The dimensions of the two pieces are not important. The dimensions suggested will provide more than adequate support for a 2m antenna but can be made even smaller if desired. The T shaped piece can be easily cut out of flat aluminum stock with a hand saw. The clasp piece is best formed by using a hammer and a wooden dowel to form the clasp so it fits over the rain gutter of any specific car. To prevent marring of the car's surface, the lower part of the T shaped piece and the clasp should be covered with electrical tape or a surface covering of epoxy.

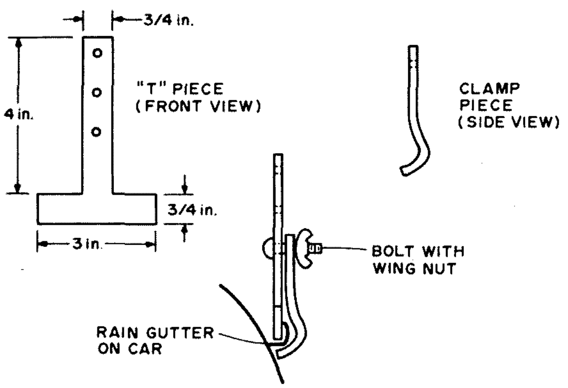


Fig. 3. Rain gutter mount showing "T" piece, clamp piece and assembly of two pieces together on rain gutter. All holes are ¼".

Antenna Placement on Mount

After having gone through the above work, I thought it would be a simple matter to mount the vertical antenna radiator in-line on the long vertical portion of the T piece by means of two insulated power supply type screw terminal posts. The inner conductor of the coaxial line could then be easily connected to the lower one of the two insulated screw posts. This scheme was tried using teflon insulators on the terminal posts and a variety of vertical radiator elements ranging from a flat radiator the same size as the vertical section of the T section of the mount to a thin diameter whip type radiator. To make a long, painful story short, it was not possible to secure less than about a 2.5 to 1 SWR on the transmission line to the antenna no matter how much any vertical radiator was shortened or lengthened beyond ¼ λ. A reasonable SWR could only be secured if some reactance were introduced between the transmission line and the antenna. This clearly indicated that the probable capacitive reactance between the base of the radiator and the mount was the cause of the problem. To test this idea, the vertical radiator mounting was offset from the rain gutter mount by means of a plexiglas separator as shown in Fig. 4. A telescoping whip was used as the vertical radiator. After a few minutes of experimen-

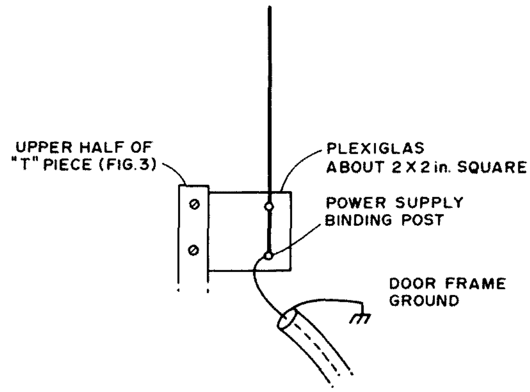


Fig. 4. Use of a plexiglass piece to isolate antenna from reactive effects of rain gutter mount.

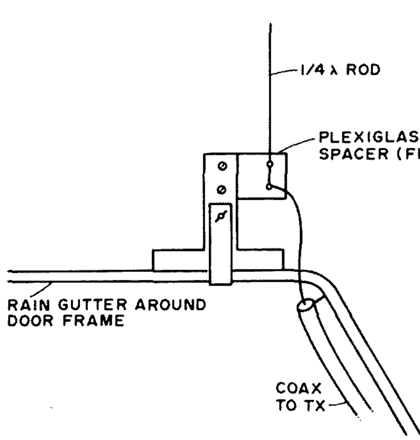
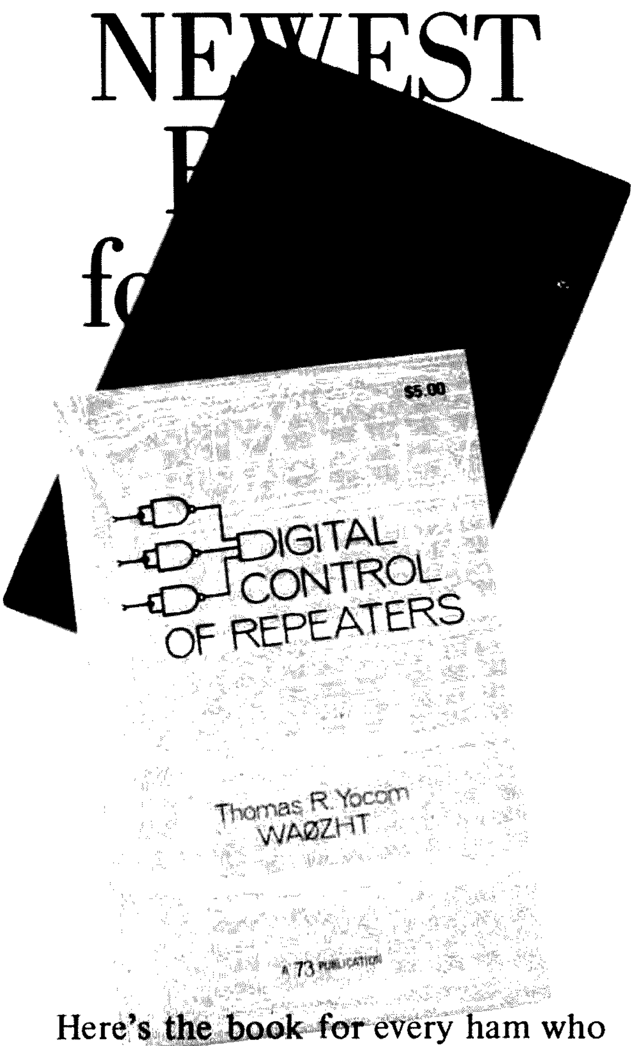


Fig. 5. Usage of the mount shown in Fig. 3. on the rain gutter of the front right door frame of a car.



Here's the book for every ham who wants to design and build a digital repeater control system (or who wants to just think about doing that). Contains sections on repeaters, basic logic functions, logic circuit design, control systems, support circuits, mobile installations, touchtone, plus a special section on a "mini" repeater control system. 224 pages.

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tation, it was apparent that the solution to the problem had been found. The length of the whip could be adjusted, using a SWR meter in the transmission line, to produce a perfect 1 to 1 SWR.

Perhaps the same effect could have been obtained by simply separating the vertical radiator element from the mounting by a greater distance rather than offsetting the radiator from the mount. But, the former appeared far simpler mechanically.

Fig. 5, shows how a final version of the antenna is mounted on my car. A rather large threaded knob rather than a simple butterfly nut is used to tighten the gutter mount bolt but aside from this, the antenna is exactly as described.

Results and Ideas

The antenna works almost as fine as a ¼ λ whip mounted directly in the center of the roof of the car. Some directional effects are noticeable because of the mounting position but for all general purposes they are minor unless one is at the absolute fringe area of a repeater's coverage. Other considerations in a mobile environment once full receiver quieting is not achieved usually will overshadow the 1-3dB advantage achieved by having the antenna mounted in the center of the roof rather than on the side of the roof.

Checks with a SWR meter showed that as long as the radiator element length is left unchanged, the antenna could be repeatedly mounted on approximately the same position on the rain gutter without effecting the SWR. The relatively easy to construct rain gutter mount described may be of interest if one would like to mount two or more vertical radiators on a car and phase them via delay lines in the transmission lines to each radiator to form an electrically steerable radiation pattern. Although perhaps not too useful for normal mobile operation, such capability would be of definite advantage for a mobile station operating over one of the Oscar satellites. This mode of operation will be described by me in a future article concerning simple, electrically steerable antennas for both mobile and fixed station operation over our amateur satellites.

. . . 73 Staff

George Hinds WB8JYR
26833 Maple Dr.
Westlake OH 44145

"TWO-METER TYPES YOU HAVE MET"

With scanner lights blinking and speakers alive with simplex and repeater activity on 2m FM one recent evening, I found myself classifying several of the amateurs in back of those far away voices by their personal operating methods. Surely you, too, have met them from time to time, for they are not by any means peculiar only to my locale.

For example, just a few minutes ago I listened to "Old Joe Toe-Stepper." Verily, Joe has "the fastest thumb in the midwest!" Never yet has he allowed a second of silence to elapse between transmissions when in QSO; no "breaker" is going to get in on Joe at any cost (even though it may be an emergency involving life and limb).

And here is "Billy the Breaker" again! Just when an interesting QSO is underway and listening is both enjoyable and informative, Billy "breaks." More often than not, he succeeds in breaking one's train of thought, the interest of the listening stations and finally the QSO, since his contribution is limited to "Ah's" "Oh's" "I don't know" and "Am I getting out?"

Everyone on the local repeater has met "Carl Clockwatcher" and caught him in his first contact with someone new on the repeater. Someone told Carl that the machine has a three-minute timer to limit emissions and, by golly, Carl wants his share of that air time. With fixed stare at the clock on the wall of his shack, he mumbles into the microphone for two minutes and fifty-nine seconds with each transmission, despite the fact he has nothing really to say. However, I have noticed lately that Carl is more and more often calling on the repeater without raising a response; even the newest newcomers soon learn to avoid that boring trap from which it is so difficult to escape gracefully.

A few nights ago I listened to "Sid Screamer." You know Sid – he's the fellow who believes unshakably that yelling into the mike will carry his signal louder and clearer than anyone else on the machine (even though his excessive deviation just took him out of the repeater receiver). Oh, you know Sid?

Does everyone have a ham in the area like "Henry the Hardheard?" You can often hear him complaining at hamfests about his always brilliant QSO's being clobbered by some nasty repeater that is deliberately "out to get him." I heard him this summer crying that all too often the local repeater would be activated deliberately to interfere with a QSO of his. The truth of the issue was found to be that old Hank insisted on working simplex on the repeater output frequency right under the umbrella of the machine and the "interfering" stations were mobiles away out in the far reaches who could not know of the QSO going on. No, Hank insists he'll continue to use "simple" 94 (or 88 or 16 too) for he won't be regimented away from his pet simplex frequency by any repeater council plans.

All too numerous among the ranks of hamdom is "Pete Plunker." Pete's two-meter operation consists of switching his rig from repeater to repeater and plunking each one successively and repeatedly to reassure himself that all the area machines are operational. Of course devotion to this self-imposed duty requires that he perform his plunking

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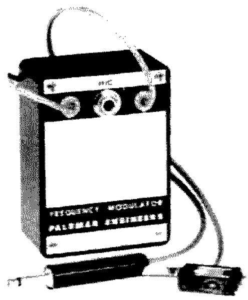

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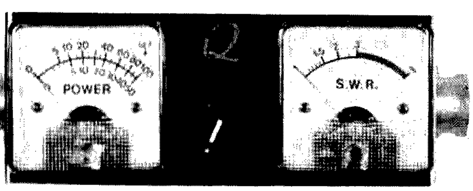

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secretively and with a high degree of regularity so as to elicit yelps of frustration and despair from the monitor stations on the frequency. No, Pete obviously doesn't identify himself nor pay dues to any of the repeater groups. He rationalizes his activity by saying that he doesn't use repeaters (he just tests them!). However, he does spur the technicians responsible for the machine to greater activity; at last report they were working on a guard system for the repeater to curtail Pete's perverted enjoyment of two-meter FM (and sorrowfully thus deprive some transient mobiles from having a repeater available).

And then there's the sorriest specimen of all, the local "Mystery Ham" who has obtained the access touch-tone code for the various repeater phone patches and spends his days and nights indiscriminately opening phone patches without identifying or even dialing up a number. He just lets the patch hang until the timer takes it out or a monitoring station shuts it down! There are some who say it can't be a ham doing this but instead is someone of questionable (and unprintable) ancestry who delights in destroying the good work of others. Whatever or whomever it is, dire threats of "reverse-type" antenna parties (or worse) are directed toward him and direction-finding is the project in many minds.

Despite these few drawbacks, 2m FM is now becoming the fastest-growing segment of amateur radio. The specimens identified above are vastly outnumbered by good amateurs who make the band a really fine place to hang out. Countless stations are on frequency, not just for local ragchewing, but to offer a friendly voice and helpful directions to all who pass through our area. One has but to complete a lengthy trip with the companionship of a good 2 meter rig to notice the miles of boredom have been turned into smiles of friendship. On freeways or through barren back roads, a contact with a fellow ham is generally available, so the day (or night) is made shorter and "highway hypnosis" is dispelled. Try it. Thousands of fellow hams know you'll like it!

. . .WB8JYR

Pete Walton VE3FEZ
421 Lodor Street
Ancaster, Ontario
Canada

HOW TO WIN FRIENDS AND INFLUENCE THE 2-M MAN

The other night I walked into the club shack, and there it was, a new rig. It was about 12 inches long, 8 inches deep and about 4 inches high. On the front were two rows of eight lights and eighteen pushbuttons. It also had an on and off switch, volume control and squelch. Hmm, looks like two meter FM with automatic scanning. I should explain that I am a 20m phone man and never used FM gear before. Maybe I should see what this FM business is all about.

Power on. That was easy. One of the sixteen lights even came on, the first one in the top row. That must mean that we are on the first channel. Nothing to this FM business. Wonder why it won't scan? Push all the buttons in – still won't scan. Pull all the buttons out again – still no scan. This looks like a problem. Try all the buttons one at a time; still no luck. Now there is only one control that I have not moved. Advance the squelch control to get rid of that awful noise. Ah ha! It starts to scan all eight lights. Seems that this scanning feature locks up even on noise; good idea. Looks just like Christmas now, scanning all eight lights over and over again. Still haven't heard anybody yet. Let's try a CQ and see if it works. Pushed the channel one transmit button and the rig stopped scanning with the channel one transmit light on. This all seems very normal, even to a twenty meter phone man.

Well, here goes. C.Q. C.Q. C.Q. C.Q. Two meters. Got an answer right away. I was told in no uncertain terms that you don't call C.Q. on two meter FM especially through a repeater. Okay, I explained that I was new on two meters and didn't know all these things yet. The fellow was really very nice about it and explained all sorts of things about FM.

Then he said, "Let's go to 94." Oh, oh, no 94 on this rig, only 1 to 8, but he explained this also. Pushed in channel 4 and sure enough there he was. We had a really enjoyable QSO on 94 – no QRM, no QSB, and it was very informative.

He did, however, forget to remind me of one very important little matter which I will discuss next. After we signed off, the rig started scanning again. It stopped scanning on channel 3 and somebody asked if there was anyone on frequency. I answered and explained that this was only my second QSO on two meters. The fellow was very nice and volunteered all kinds of information about two meter operation. I told him all about the fun I was having on two meters and then went on to completely describe our club station. Told him about my own station. I then made some comments about how much better the lower bands were. "Okay, back to you, old man," . . . hmmm, nobody there! Now I began to remember what the other fellow had forgotten to remind me about. It seems these repeater stations have some type of time-out device. Forgot about that . . . I listened to the other channels for a minute and heard a fellow say he was on his way out to the repeater and he was suggesting the possibility that I may be of doubtful parentage. Oh well, back to twenty meters. I can stay out of trouble down there.

. . . VE3FEZ

Cecil Phelps K4HHI
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Complete MOTOROLA METERING Plus !

If you need complete metering, monitoring, and control for alignment or routine service of Motorola FM units, this article should be of interest. This unit is fairly simple to build, has all the metering available in the popular Motorola P8501 Test Set, and new parts cost should run under $30.00, much less with an average goodie box.

In addition to the 8 position transmitter and receiver monitoring, it has the following: 1 field strength meter with gain control; 2 speaker and volume control; 3 four pin mike jack; 4 PTT hold switch; 5 3V dc jack (GE Progress Line etc.); 6 tone input jack.

Parts layout is not critical, so each individual can come up with whatever suits him best. Most parts are stocked at local supply houses, balance available through any of the popular mail order catalogs. Mine was built on a 9" x 7" x 2" chassis.

When the wiring is completed, the usual visual checks should be made for loose solder, cold joints, wires or pins shorted, etc.

OPERATION

Note: field strength, plate current, and 3 VDC switches stay in the normal-off position, unless in use. The transmitter-receiver switch should be placed in correct position before plugging into respective unit.

Field Strength – use small antenna or test load for rf pickup. Key transmitter and adjust sensitivity.

Polarity – change position any time meter reads backwards.

3 volts dc –,use for GE Progress Line, TPL, etc.

Plate Check Only – meters plate current in P.A. regardless of 8 position switch.

Transmitter Key – holds transmitter on for alignment, etc.

Mike Jack – for using mike in trunk, etc.

Tone-In Jack – for inserting audio for adjusting modulation.

Position #	Average Reading	Receiver
1-	-1.5	2nd if G1
2-	-18/40	1st LIM G1
3-	-25/35	2nd LIM G1
4-	Zero	Disc. Secondary
5-	-12/16	Disc. Primary
6-	-12/40	Osc. G1
7-	+10	B+ 200V
8-	+10/20	Audio Out

	Average Reading	Transmitter
1-	None	Blank
2-	None	Blank
3-	-13	Tripler G1
4-	-10	2nd Doubler G1
5-	-16	Dou-Driver G1
6-	-15	P.A. G1
7-	+17)HV=reading x 20)	B++ 340V
8-	+40 (A V=15V FS)	A+ unkeyed

Table 1. Average readings for 80D series, transmitter and receiver.

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STANDARD SIZE - 0.5 x 2.125 x 1.78

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10 position decimal	$2.50
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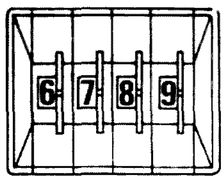
10 pos. BCD only	$2.75
End Plates (per pair)	$1.00
Divider Plates	$1.25
Blank Body	$ .30



All switches are black with white figures and snap-in front mounting.

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2" SCOPE TUBE SHIELD – Manf. by Millen. Ship. wt. 1 lb. **$3.95**

PAMONA BOX – 2 1/4 x 1 1/8 x 7/8 Miniature box w/BNC plug & jack – good for attenuators & other small projects. Ship. wt. 1/2 lb. **$3.95**

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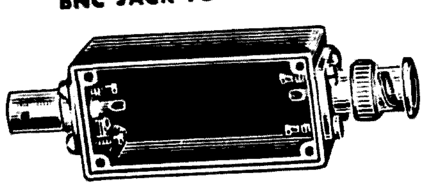

MINIATURE SWITCHES – DPDT
Miniature Push-button switch **$1.50**

MINIATURE SWITCHES – SP6T Enclosed Miniature rotary SW. ½" dia. **$1.50**

EQUIPMENT COOLING FAN – 115V AC – 3" diameter – w/mounting bracket – 3 lbs. **$3.50**

$5 Minimum Order Visit us when in St Louis Please include sufficient postage

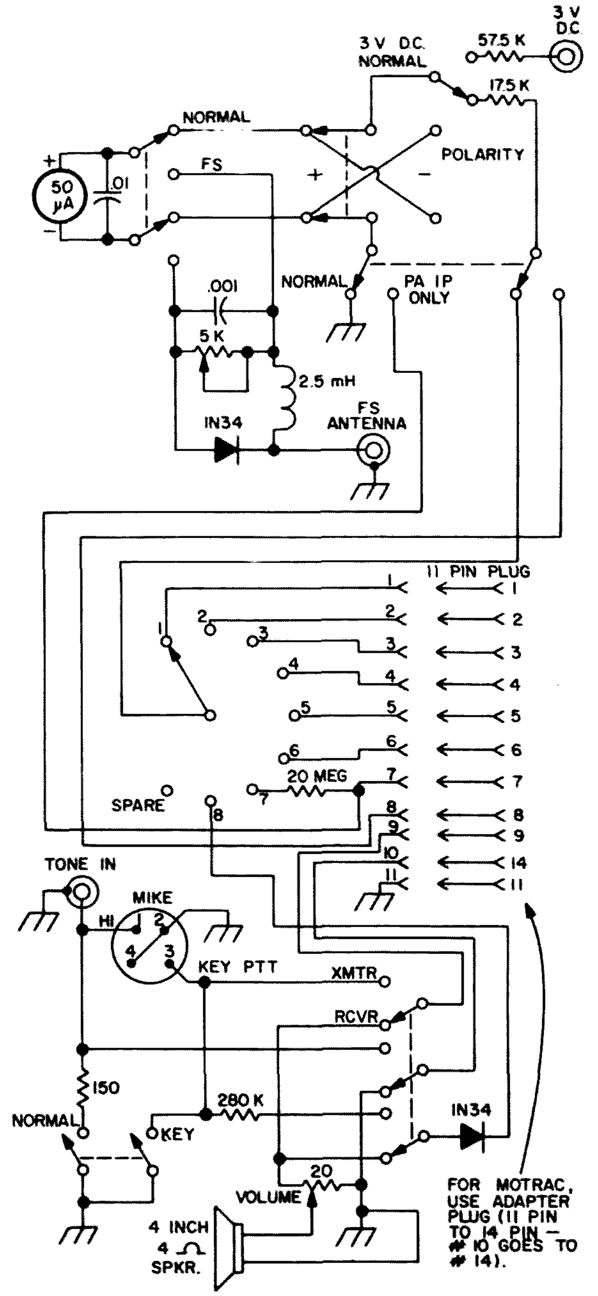

Fig. 1. For Motrac, use adapter plug (11 pin to 14 pin – #10 goes to #14).

8 Position Switch – for transmitter and receiver stages. See Table 1 for 80D series. (Most are alike, but consult manual for exact specs).

PARTS LIST

Meter – 50 μA (2500Ω)
11 pin plug – Amphenol 86GP11
4 pin jack – Amphenol PC4F
Switch (9 pos.) – 9 position rotary, 1 pole
Switch (Xmtr-Rcvr) – 2 position rotary, 3 pole..

. . .K4HHI

Frank J. Miller K6QFO
R.A.C.E S. Club
Country Government Center
Redwood City CA 94063

AM Or FM INPUTS

(on the same frequency)

Most modern repeaters have gone to FM input and FM output. Of the few AM repeaters left in existence most are connected with Civil Defense or RACES groups. Just try and get the cities and counties to buy new or used FM equipment all at one time when they still have good operating equipment. It's impossible.

An AM input to FM output machine was put into service in San Mateo County to connect the coast to the main peninsula. There is a range of mountains running the length of San Mateo County and almost down the center. Using simplex AM units, communications were almost impossible from the coast to the peninsula. With the repeater, solid communication to and from the coast was possible.

In the beginning most of the stations were AM into the repeater. As the Civil Defense group got used to the machine more and more wanted to try FM. Try putting an FM signal through an AM receiver. The first plan was to use another input frequency, but due to the limited Civil Defense approved frequencies the same input had to be used for AM and FM.

Upon experimenting it was found that an FM and AM receiver could be tied together with an antenna splitter (with preamp built in) and worked like a dream. The preamp was used to cut down the losses when connecting the two receivers together. Audio output from both receivers is tied together through small solid state amps. The keying of the repeaters with an FM receiver usually used a carrier operated relay (COR), which worked fine on an FM signal, but when an AM station came on the COR chattered or refused to work. Finally a voice operated relay (VOR) was used on the composite audio and worked fine.

We now have quite a growing group using anything from Twoers to Motorola bricks, this really brings out the old equipment and an incentive to go on FM. Some day we will remove the AM receiver, but during a disaster every piece of equipment can be used on the AM or FM input. Try it, it really works.

. . .K6QFO

K6QFO is located on Pise Mountain in the coastal range at an elevation of 2000 feet. Covers Bay area, and parts of the Sacremento Valley. Coverage drops off in San Jose.

Allan J. MacDonald WA1KJI
31 Warwick Avenue
Williamstown MA 01267

ANOTHER LOOK AT VERTICAL WATERPIPE ANTENNAS FOR TWO METER FM

There have been numerous articles written on this subject in the past; yet the fact that confusion abounds is confirmed by talking to groups who have tried to build these devices.

At the present time the Northern Berkshire Amateur Radio Club (K1FFK 146.31–91) (WA1KFZ 146.10–70) (K1FFK 52.76–52.66) has 6 of these in operation – three 20 footers, two 30 footers, and one 40 footer. These antennas have proven themselves perfect for amateur repeater use.

The ideas presented here were developed by K2CBA, K1DEU, and myself while constructing and checking out the club's antennas.

The antenna is a multiple of 1/2 wave elements with 1/4 wave sections on each end and a 1/4 wave conductor which acts as a stub to reduce feedline radiation. See Fig. 1.

Construction of the antenna proceeds as follows:

1. From the formula $\lambda/2 = 492/F(Hz)$ calculate the half wave length in air for 146.00. This comes out to 3.4 FT or 40.8 inches.

2. Select the coax you wish to use and obtain information on the velocity factor of the coax. Generally solid dielectric coax has a velocity factor of approximately .66 while foam dielectric velocity factor is approximately .8. I would recommend the solid because of its better heat resistant qualities and it makes a smaller antenna. For solid coax 1/2 wavelength is approximately 26.90 inches. In general, the velocity factor varies by as much as γ5% from manufacturer to manufacturer. Measurements with a pulse generator and Tektroniks 585 confirmed that there was enough variation that some sort of procedure for taking this into account must be developed.

3. To proceed with the fabrication, two pieces of equipment are needed – a signal generator (low power transmitter) covering the range desired (140–150 MHz) and an SWR bridge. With these in hand, fabricate a 3 element section (three 1/2 wave elements including the 1/4 wave top element (13.5") and radiator 19.25" and the bottom 1/4 wave stub. With this completed, hang the antenna equidistant from the floor and ceiling and measure the resonant frequency. If this is not within γ1 Hz of your desired frequency open the antenna and trim the 1/2 wave elements until you are within that

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6 meter	Single	25 dB	2 dB	$15.50	$18.50
2 meter	Single	20 dB	2.5 dB	$15.50	$18.50
2 meter	Double	40 dB	2.5 dB	$30.50	$36.50
220 MHz	Single	17 dB	2.5 dB	$15.50	$18.50
220 MHz	Double	35 dB	2.5 dB	$30.50	$36.50

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Albany, Ga. 31701
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range. Do not worry about the actual VSWR; look only for the VSWR minimum.

4. Depending on whether you are slightly high or low compared to your design frequency, alter another pair of 1/2 wave elements cutting them 1/4–1/2" longer if you are too high and 1/4–1/2" shorter if you are too low. Solder these into the antenna and check again. Continue this operation adding pairs of elements and checking until you have reached the mechanical length you desire. The antenna can be any length you feel is mechanically supportable. If possible, try to stay a little on the high side of your design frequency.

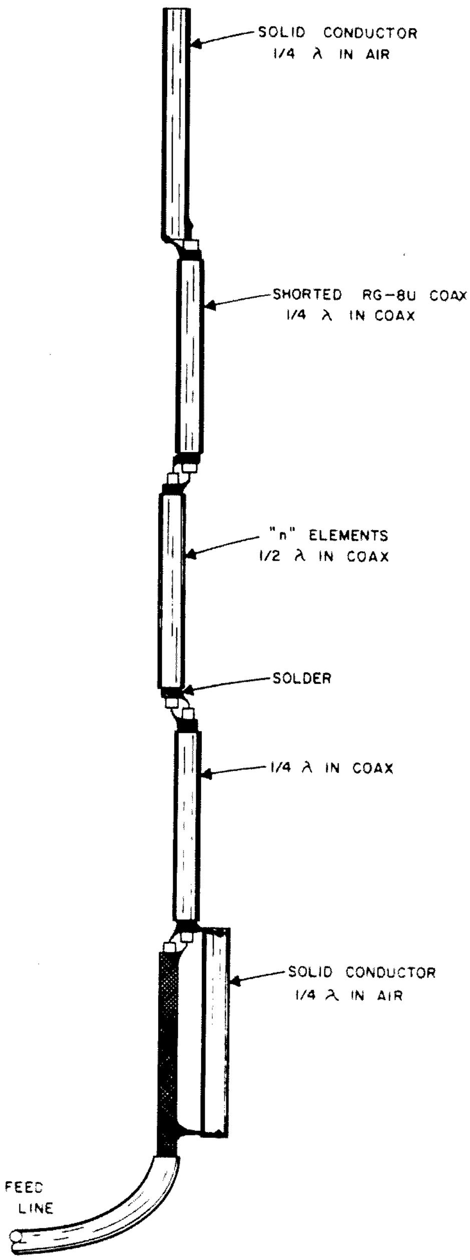


Fig. 1. Antenna construction.

5. When you have reached your desired length, stop adding sections and run a test by powering the antenna from a transmitter and running a wave meter (absorption) up and down it, each element should be radiating equally if you have no shorts or opens.

6. Now tape each junction completely with 3–4 layers of good electrical tape. This gives mechanical integrity and some sealing to the connection.

7. Again check for the minimum VSWR point. Hopefully you have come out a little (250–500 kHz) high of your design frequency. With the antenna draped in the air again, take some 1" wide strips of aluminum foil and hang over the taped electrical connections. Play with these strips, removing, adding, etc., until the minimum VSWR point is exactly on design frequency and the VSWR is also minimum. It is a two-man job at this point.

8. When you have the thing "right on," tape over the foil permanently holding it in place.

9. If you have built a 25–40 footer, your VSWR should come out to better than 1.1 to 1 and hopefully 1.0 to 1. If you have built an antenna less than 25 feet, your VSWR may be as great as 2.0 to 1. This is because the impedance of the bottom 1/4 wave element is not correct (I think). This can be compensated for by the addition of a matching stub (solid conductor) in parallel with the feed line quarter wave stub. Vary the point of soldering this to the feed line for minimum VSWR – using this technique, the VSWR can be brought under 1.2 to 1.

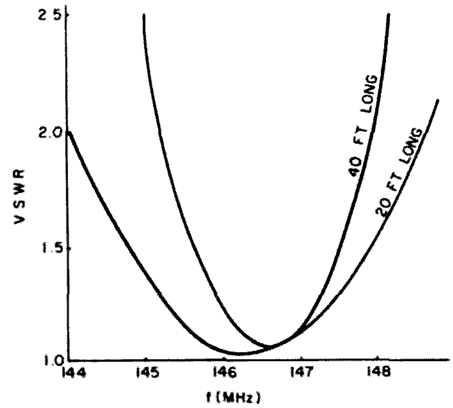
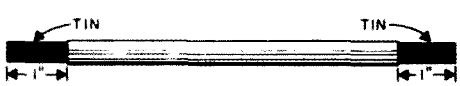


Fig. 3. VSWR plots on 2 antennas.

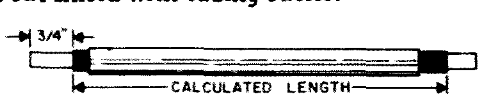
1) Cut to desired length + 2.0"

R6/8U Solid Dielectric

2) Cut insulation back 1" each end flux and tin each end.



3) Using tubing cutter, cut shield off 3/4" from first end, measure final dimension (from calculations) from shield on cut end to other end, mark, and cut shield with tubing cutter.



4) Using single edge razor trim insulation leaving 1/16–1/8" remaining.

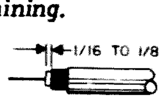


Fig. 2. Method of element preparation.

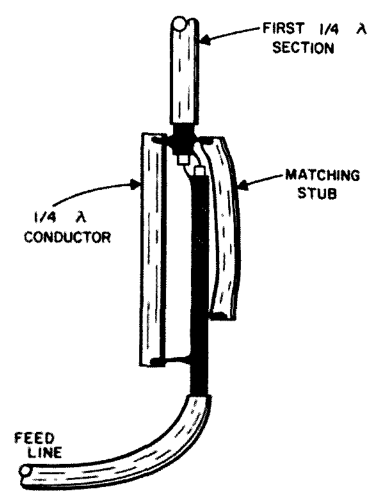


Fig. 4.

10. Now pick up some 1-¾ 2" OD PVC pipe and fittings and build a housing for your new creation. The 20 foot unit should show six dB gain while the 40 foot should have 9 dB gain omnidirectional, of course. The longer antenna will have a flatter pancake coverage pattern (vertical plane); and, of course, its VSWR plot will be sharper.

Good luck! Hope this has helped.

. . .WA1KJI

MOTOROLA MODEL NUMBERS

More and more hams are enjoying 2 meter FM and many are using or thinking of using low priced Motorola used equipment. The following info may help clarify the meaning of the model nomenclature.

T43CMT-1130A

1st character (T) (Housing)

B	= Base
D	= Dash mount
H	= Portable (max. portability)
M	= Monitor rec.
P	= Portable
R	= Railroad
T	= Trunk mount
U	= Universal Mount

2nd character (4) (RF out)

0	= Rec. only
1	= less than .75W
2	= .75 – 3.9W
3	= 4 – 15W
4	= 16 – 40W
5	= 41 – 69W
5	= 70 – 100W
7	= 101 – 134W

3rd character (3) (Freq.)

0	= Below 25 MHz
1	= 25 – 54 MHz
2	= 72 – 76 MHz
3	= 144 – 174 MHz
4	= 450 – 470 MHz

4th character (C) (Rec)

A	= Sensicon "A"
B	= Unified chassis (450M)
C	= Mocom
D	= Portable
G	= Sensicon"G"
H	= Motrac
L	= Motran

5th character (M) (Xmtr)

A	= 30–60W "A" transmitter
B	= Unified chassis (450)
C	= Lo + UHF portable
E	= High band portable
G	= Mobile +AC utility "G" xmtr
H	= Motrac
L	= Motran
M	= Dispatcher

6th character (T) (Power)

B	= 117V.AC
C	= Battery (dry)
D	= Dynomotor
M	= Transistorizes w/ int. bat
N	= No power supply
T	= Fully transistorized
V	= Vibrator

7th character (1) (Squelch)

1	= Carrier
3	= Dual (PL)

8th character (1) (Chan. Sp)

0	= Wide band
1	= Split channel

9th character (3) (# of freqs)

0	= 1 trans & rec
3	= 2 trans & rec
7	= 3 trans & rec

10th character (0) (Power)

0	= 12 volts
1	= 6/12 volts
4	= 6 volts

In the example at the top of the page, T43CMT-1130, this would be a trunk mount, power between 16 & 40 watts, between 144 & 174 MHz, Mocom receiver, Dispatcher transmitter, fully transistorized power supply, carrier squelch, narrow (split) band, 2 freq using 12 volts. This may help those who are new at the game of trying to figure out what a mobile unit really is.

Reprinted from SCOPE

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ADJUSTING FM DEVIATION

Proper adjustment of the deviation control is important for good FM communications. If it's too low, the audio at the receiver is also low. If it's too high, you may be over-deviating and getting signal reports that – though your signal is strong – break up when you talk.

Test instruments for measuring transmitter deviation cost upwards of $250. There is, however, a shortcut method of deviation measurement using an FM receiver and an ac voltmeter (or oscilloscope).

To adjust deviation using this method, you must use a receiver of the appropriate bandwidth. Economy price monitor receivers of undertermined bandwidth are of no use here.

If you want to use a narrow band ±5 kHz system, you must use a receiver with ±5 kHz bandwidth. If your system contains both wide and narrow band units, adjust all transmitters for narrow band operation. This will cause slightly reduced audio in the wide band receivers, but will provide much better overall performance. Most commercial units: Motorola, GE, etc., have power supplies which will allow the transmitter and receiver to be used simultaneously for short periods of time. Refer to the schematic for your particular rig to see how this can be accomplished, as you can then check your transmitter deviation using the associated receiver as a monitor.

The hookup for measuring is as follows: Connect an ac voltmeter or scope across the speaker terminals. Apply a 1 kHz tone to the transmitter. If an audio oscillator is not available a constant whistle of about the same frequency into the mike will do. With the deviation control at the lowest position (CCW) key the transmitter and slowly advance the control while watching the ac meter. If feedback occurs, or if you can't stand the noise, substitute a 5W resistor of the right value for the speaker.

As you increase the transmitter deviation you'll see a fairly linear increase in the receiver audio level, followed by a flattening out, and then, as you go outside the passband of the receiver, the audio level will fall off and the noise level will increase. This is an excellent example of what happens when an over-deviated signal is received by another FM mobile.

Repeat the control adjustment several times, paying particular attention to the point at which the linear rise just starts to flatten. This is the point at which the deviation control is properly set.

I've used this method to set deviation on many, many occasions and have been amazed at its accuracy when compared against properly calibrated instruments.

. . .VE3FGS

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A 146 MHz MOBILE ANTENNA

Here is a very inexpensive antenna which uses your car body as the ground.

In Australia, mobile operation on 146 MHz FM, using discarded mobile radiotelephones, is very popular. As with all amateurs the author has given considerable thought to getting the most signal out with a minimum outlay. The units available restricted the actual power available, without major modifications, so the next important link in communications, the antenna, received my attention.

The most used antenna is the quarter-wave whip. This antenna leaves a great deal to be desired especially if it is mounted on the mudguard where shielding reduces its effectiveness. After all, not all of us like to carve holes in the center of the roof. An antenna which has some appeal is the coaxial dipole, an efficient radiator, which could be elevated above the car roof to minimize shielding. However, this antenna has problems with feed lines in its standard form. Below is the story of how these difficulties were overcome to produce a gain antenna utilizing a cheap base connector.

The normal coaxial dipole consists of a quarter-wave whip on top of a metallic supporting pole which is metallically and electrically joined to a quarter-wave sleeve. The coaxial cable inner is connected to the bottom of the whip and the braid to the pole and the sleeve. This system produces a strong ground wave but also produces standing waves on the supporting pole. By placing radials a quarter-wave below the bottom of the sleeve they act as an rf choke to reduce the standing waves on the pole. A secondary effect of these radials is to utilize the standing waves to reinforce the original radiated signal. Thus the radials add to the gain of the antenna.

If such an antenna could be used with the car body acting as the ground plane we would achieve a very efficient mobile radiator. The feed impedance of a coaxial dipole antenna is a nominal 75Ω and normally it would be necessary to feed the coaxial cable up the center of the supporting pole to the feed point. This necessity would make the antenna a rather messy one to attach to a car. On studying the suggested antenna it was realized that the distance from the ground plane to the feed point is approximately a half wavelength.

One fact emerges from this discovery. Because impedances are repeated each half wavelength on a transmission line it is

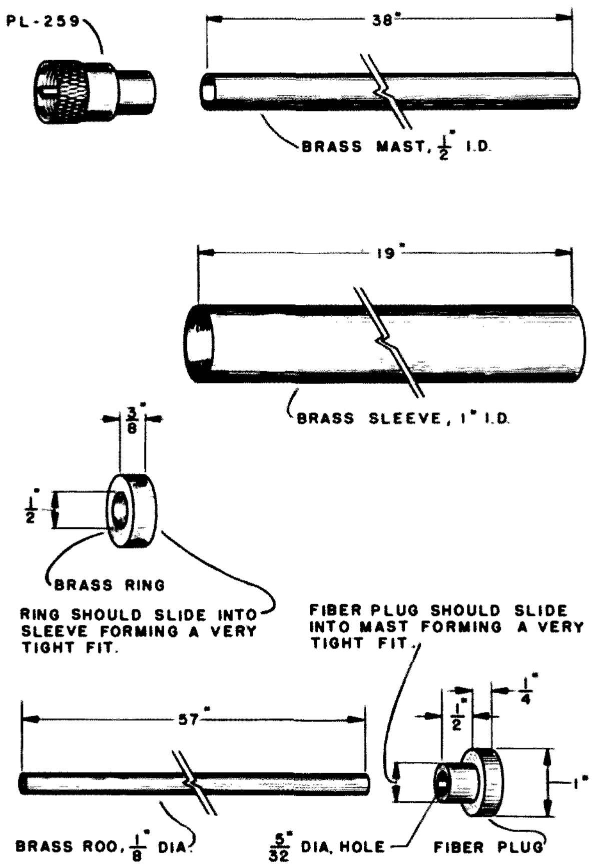

Fig. 1. Sub-assemblies for 146 MHz coaxial dipole Items shown are not drawn to scale and most critical dimensions have been left out.

possible that a feed point impedance at the ground plane could be repeated in impedance at the junction of the whip and sleeve. However, because of velocity factor effects on transmission lines, it would be impossible to use ordinary coaxial cable for this purpose. The transmission line must have a velocity factor close to unity.

A transmission line with a velocity factor of unity is air spaced coaxial cable. By now the reasoning may have become clear to the more astute. The support pole can become the sheath of an air spaced coaxial cable so that a wire fed centrally through its half wavelength will produce the required unity velocity factor half wavelength transmission line. The impedance of this line is not critical as it will repeat the impedance seen at one end to the other. This means that the materials used can be governed by the fittings and facilities of your own workshop.

In practice the inner conductor will need the support of two or three beads along its length. These could be pieces of poly from coaxial cable. This will tend to reduce the velocity factor very slightly. The bottom section of the antenna due to end effect is slightly less than a half wavelength. You will find that these two factors just mentioned tend to cancel each other out.

There are many ways of fabricating the antenna and one suggested method is shown in the accompanying sketches. For economy the PL239 plug assembly was chosen for a base connector. The half wavelength supporting tube is brazed or soft soldered to the tailpiece of the connector. Incidentally, pick a connector with an insulation material that is not susceptible to heat. Also note that the bottom section length should make due allowance for the length of the connector used. A brass spacer ring is brazed or soft soldered to the top of the support pole. This brass ring is drilled and tapped at three or four points to allow the brass sleeve to be screwed into position.

The inner conductor and whip is made from one piece of material. One end of this material is reduced to fit into the inner of the connector. Slip the support beads on the inner conductor, insert it into the support pole and solder the end to the connector. Next a small fiber, or similar material plug is fed over the whip end of the inner conductor and pushed to the top of the support pole. A generous application of an epoxy based glue at this point will complete the construction.

When installed the SWR may be shifted slightly by varying the length of the whip section. On the few antennas made by the author the whip length was deliberately made long, about 22 inches, and then reduced bit by bit till a minimum SWR was achieved.

In-operation tests were made by comparing against a standard quarter-wave whip, both mounted on the center of an automobile roof. In all tests, changing from the quarter-wave whip to the coaxial type antenna more than doubled the limiter current of the FM receiver used for signal strength comparisons. Some of these antennas with normal quarter wave radials have been used as home station antennas with excellent results.

. . .VK2BAU

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Miniboxing the 1.65 MHz i-f

(432'er Series)

Here is a 1.65 MHz i-f strip, all built into a minibox, for use with VHF converters.

Why build something like this? Well, I made the unit to go with my 432'er transceiver, but it certainly will work with just about any HF or VHF converter to provide good selectivity and high i-f gain along with adequate image rejection. Besides that, how many good transistorized i-f strips are there around these days?

The two transistors in this amplifier give you all the gain you can ask for when used with a low frequency (135 kHz) i-f amplifier. This is where you really pick up your selectivity.

As usual for me I first built the unit on a breadboard where I could get at it and experiment with all of the components. There were enough headaches in getting this to work so I was glad that I hadn't started out cramming it all into a minibox. Once I had it working smoothly and had all the bugs out I did rebuild the finished project in a little box. Strange to say, it still worked!

Selectivity is important for two reaons: first, when used alone, and second, for avoiding images when used with the narrowband 135 kHz i-f. There are some natural frequencies for i-f use that, because of allocations, are better than others. 455 kHz is an important one, but mainly for broadcast receivers, because images can be troublesome at 28 to 30 MHz in amateur use.

The next one up is at 1.65 MHz, just outside the broadcast band, giving an image more than 3 MHz away from the desired signal. A number of low-cost receivers have used this i-f; however, the selectivity of these receivers has generally suffered when used on the crowded bands, or even on VHF openings.

So in this 1.65 i-f we have not put in crystal or ceramic or mechanical filters because of cost, but rely instead on the addition of the 2 x 4 in. minibox converter

and narrow band i-f to supply the selectivity needed. Needless to say at 135 kHz you can get almost any degree of narrow bandwidth you want to use on 432 and 1296 MHz, or any other VHF band.

Fortunately we have found an i-f transformer core design that makes homebrew winding at 1.65 MHz easy and still results in adequate selectivity. See Tables I and II.

Keep in mind that in a triple conversion receiver, as well as in a front end, image response is at times very important. If the 1.65 MHz i-f does not have sufficient selectivity the 135 kHz image only 270 kHz away could come through it. The three tuned circuits used, one of them being in the output of the 28 to 30 MHz tuneable converter, form a 1.65 MHz i-f that does the job in good style.

Gain design

As mentioned before, it is easy in the 432'er to actually suffer from an excess of gain unless proper controls are used. With two low-noise rf stages in front, a good 10 meter tuneable front end used for tuning and conversion at 28 to 30 MHz, two stages on 1.65 MHz, and then two more on 135 kHz, there is more gain than needed, if all are run full on.

Inasmuch as the experimenter builder may at times also want to use some of these units separately for various tests or operations, each of them should be subject to good control for use alone with full gain or in the complete triple conversion receiver of the 432'er. In the latter use adjustable gain to suit the individual operator's taste concerning interstation noise is needed. Two methods of gain control have been tested and they are shown in Fig. 1 and Fig. 2. They both work well, as you will find, and can serve to set the interstation noise. The one shown in Fig. 1 is the usual type with the control in the emitter of Q1. The method shown in Fig. 2 controls the base bias and gives slightly more avc action. It is really a matter of whether you have a 1K pot or one of 10 to 25K on hand.

I-f Transformer Primary Winding Tests

Having the circuit on the breadboard for the second time, the best windings for the 1.65 MHz i-f transformers were investigated, and this turned out to be very worthwhile, allowing good design control over the question of neutralization which now turns out to be unnecessary.

There are four main parameters in the i-f transformer to start with. First, the size of the wire, the number of turns, the value of the resonating capacitor, and then the number of turns on the secondary going to the following base.

We have avoided a tapped primary for the sake of simplicity, using fewer turns and a bigger capacitor to match the collector impedance. However, you can go too far in turns reduction. When we went to only 15 turns, which needed 1700 pF for resonance at 1.65 MHz, the gain was down a little.

The size of the wire showed up as more important. I can just hear i-f transformer people laughing plenty at some of these remarks, but do *they* give you all the real lowdown for homebrew winding?

I had been using No. 38 wire and then No. 34, and finally went up to No. 30 in size, just to see. I saw, all right. The Q came up to where the internal transistor feedback caused Q1 to oscillate when its base and collector windings were tuned to exactly 1.65 MHz. See also Table I on the influence of the number of turns of the base winding.

A good balance was finally reached, as shown in Table I. The number of turns is not critical, it's just that there is a region where everything, such as af, selectivity,

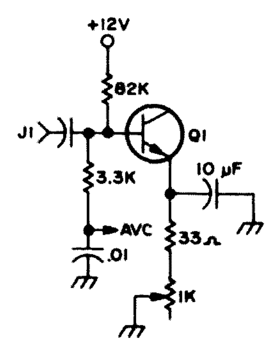

Fig. 1.

Emitter gain control.

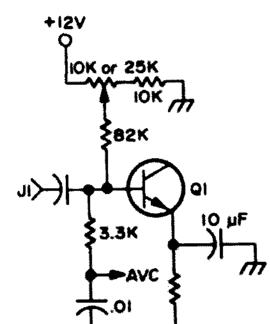

Fig. 2.

Base gain control.

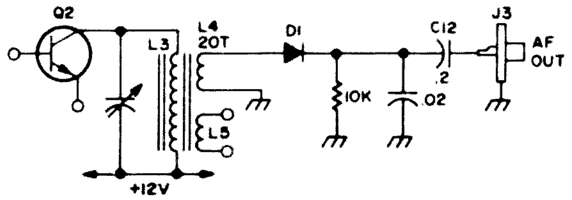

Fig. 3. Af circuits.

avc, no feedback, but still plenty of gain, are all at their best. You could get a little more gain with neutralization, but you don't *need* more gain.

Hope yours sounds as good when you build it.

The i-f transformer secondary windings were quite a revelation, even after building dozens of i-f transformers from 120 MHz to 135 kHz.

Here is the answer to feedback, oscillation, and neutralization. In the past I generally wound on a few turns, say five. For this secondary, L2, which feeds into the base of the next transistor, it worked, and I let it go at that. After all, there's plenty else to do in a complete low-noise, solid-state, high selectivity, triple conversion receiver on 432 MHz!

Having a second breadboard 1.65 MHz i-f running just to be sure of all the components going into the smallest minibox used here so far, I thought it might be a good thing to try a series of secondaries and see just what would happen. Lucky I did, as you will see. Referring to Fig. 8, the secondary winding L2 was varied with results as shown in Table I.

Table I tells the story. You *can* have both gain and absence of neutralization, if you just work at it a little.

"Boughten" I-f Transformers

The above tests on windings brings to mind right away a big question. Has the manufacturer put out his i-f transformer for an unneutralized stage or a neutralized one? I don't know! This whole subject is quite an important one and takes up the full time of various coil engineers around the country as well as the part time of a lot of device application engineers.

Once again the RCA Handbook on devices (I don't work for RCA. It's just a real good book!) is very explicit on the turns ratios of 455 kHz i-f transformers for transistors (but not the number of turns, unfortunately) in their application section on good low-cost receivers. Don't miss that section if you're going to build. I like especially their easy-to-do solution to overloading in a popular broadcast set.

Good Demodulation

This is something given considerable preference here because I *like* Admirable Modulation. It is possible to get to 432 with SSB, but look at all the converters you need! If they're low power you need a lot of amplification after you reach 432. If they're high power they cost like sin. And talk about touchy tuning. Wow!

So, more hours were spent getting good af out of diode D1, without overloading or blocking, on a loud local. This is also part

Table I. Tests on L2.

Turns	Gain	Feedback
1	Not enough	None
2	Better	None
3	Almost enough	None
4	Best	None
5	Same	Regeneration shows
10	Same	Oscillates

Table II. Winding data, I-f transformers.

Coil	Size Wire	No. of Turns	How Wound	In i-f xfmrs
L1	30, DSC	21	About 2 layers, progressive.	1
L2	34 DCC	4	On L1	1
L3	34 DCC	24	As L1	2
L4	38 DSC	20	Over L3	2
L5	38 DSC	2	Over L6	2
L6	38 DSC	15	Over L3	2

Notes. 1. Cup cores are from Miller 10C i-f transformers with all original wire and frames stripped off.
2. L5 has tape tabs for identification.
3. L6 has tape double tabs for identification.
4. Coils are wound on impregnated paper forms, 5/16 o.d., that slip over center post of cup core after winding.
5. Light application of High Q coil wax after each winding (melt on).

of the avc problem as outlined in the next section. Figure 3 shows the final af section, and it works well also. When the af diode was connected to the top of the collector winding L3, it seemed to produce a little distortion on loud signals, so a separate winding was installed in i-f transformer 2 and it really did the trick. Better tuning and selectivity and plenty of af and avc resulted.

From the way it works and sounds, this is liable to be my i-f output circuit from now on.

More and Better Avc

We really worked on this item also, and it paid off nicely. Remember, we're trying

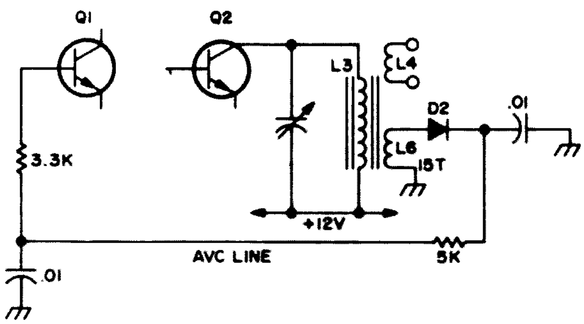

Fig. 4. Avc circuit.

to stick to a fairly straightforward circuit, just two diodes without a separate avc amplifier. Figure 4 shows details of the avc circuit that works like a charm. The trick of course is to be able to hear those stations in the next state (geographic) and still demodulate properly on a strong local without distortion.

Some like forward avc and some like reverse avc, and there are of course special reasons for both which need not concern us here. Reverse avc was always used with tubes, where the remote cutoff tubes were evolved just for that purpose. They were the opposite of steep slope jobs and used a variable grid winding inside the tube. Worked fine on loud locals. How about some transistors like that, RCA or Motorola? Maybe they already have them?

I go for reverse avc myself, because it just seems natural to cut down the current to lower the gain. Also maybe because most of the rigs I'm building have battery operation in mind.

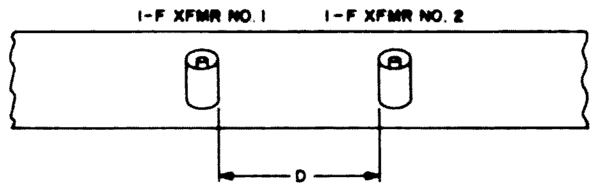

Fig. 5. Test for proximity of i-f transformer one to i-f transformer two.

In the circuit shown in Fig. 4, Q1 runs around 4 to 5 mils of current on no signal and drops down to 20 or 30 μA on locals. The dc balance for these conditions was worked out with a bunch of pots all over the place checking out the best values for R1, R2,R3, C1,C2, etc. The circuit calls for four windings on the last i-f transformer but is well worth it and not difficult.

I started with the af diode D1 connected to the L1 winding of Fig. 4, but soon found that better all-round operation resulted from a separate winding for the af which also made for better avc action.

Referring to Fig. 4, positive voltage goes to the base of Q1 through R1, is stabilized on "no signal" with resistor R2 and decoupling resistor R3, the whole line going to ground through D2. Negative voltage is developed when an i-f signal arrives at D2, and is sent through the avc line to the base of Q1, driving the current down to as low as 20 μA on a local.

Size Reduction

We're cutting down on the size a little with concentration on flatter packaging. A variety of real small size miniboxes, perhaps with adjustable partitions inside would be handy (Hey, BUD!).

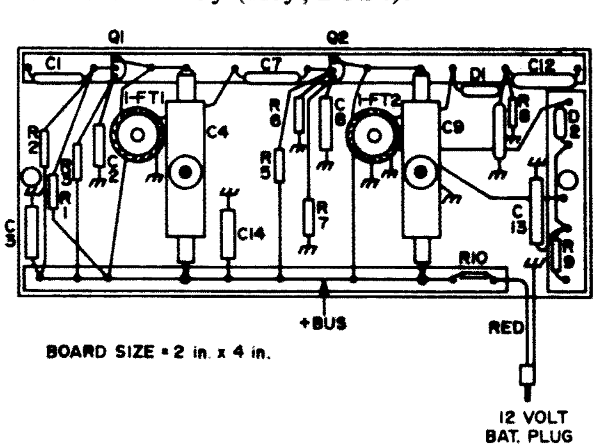

Fig. 6. Layout completed 1.65 MHz amplifier.

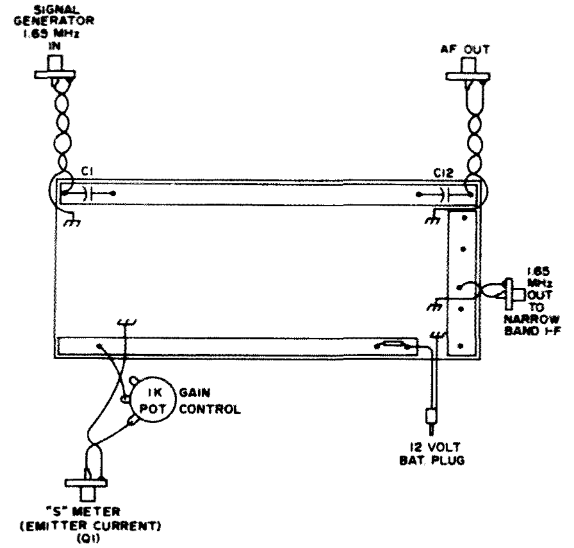

Fig. 7. Final test setup. 1.65 MHz i-f. All external components shown have to be unsoldered to install amplifier in box.

The gain control potentiometer is the biggest component here. However, Lafayette Radio comes through again on miniature components with their series at only 59¢ and only 5/8ths in. diameter.

The four jacks are of course single hole mounting types which take up a minimum of space inside.

My favorite .021 pins are used for terminals as usual, hammered into .020 holes drilled with a No. 76 drill through .035 fiberglass strips, with .005 fiberglass underneath to keep the pins from shorting to the baseboard, the whole cemented down with low-loss coil cement.

A test as in Fig. 5 was made to see how close to each other the i-f transformers could be placed with the following results: 2 in. okay; 1 in. okay; ½ in. beginning to show a little regeneration; 3/8 in. more regeneration; 1/8 in. oscillation from feedback. With the collector winding in L2 and the base winding in L1, this is an important consideration, especially for close packaging. In Fig. 5, the spacing is identified as "D." No trouble was had in this unit, as D equalled almost 1 in. Note that with magnetic coupling such as at 1/8 in. neutralization would be difficult if not impossible. An attempt was made to reduce the length of the box for this i-f unit, without success, because the two i-f transformers and the two trimmers are simply too big. However, 2 x 4 in. is certainly small enough for now.

Assembly and Layout

I generally have some sort of trouble to relate, but I guess the use of the second breadboard and checking of components was a good plan.

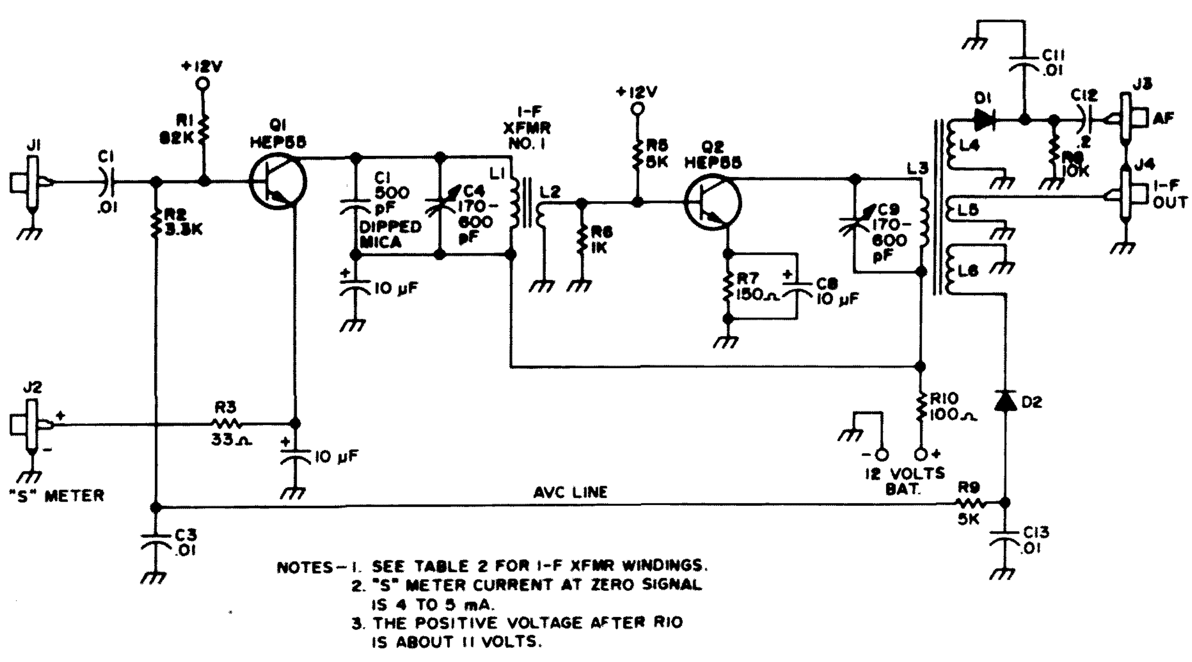

Fig. 8. Complete circuit 1.65 MHz i-f. Q1 and Q2 are Motorola HEP55.

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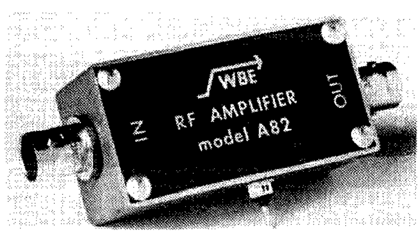

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(see QST Review, May 1973, pg. 41)

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The HEP55's with their base pin in the middle posed a small problem, but by twisting the leads around a little as you can see in the layout, Fig. 6, everything came out fine.

The key components such as diodes and i-f transformers were tested on the breadboard, so they naturally worked right away. This is mainly just a matter of avoiding soldering and unsoldering components in a very small area later, which makes for a neater final job.

Figure 6 is a faithful picture of the way the components are placed on the baseboard, and also shows the actual open spaces. This could lead to thought of further size reduction, but there we're getting near the use of a microscope, and that is quite another story.

Final Testing

With everything in place and ready to go, signal generator, af test amplifier, S meter, and battery plug connected, the "on" switch was ready to be thrown, as in Fig. 7. And this is just the time when I always get the jitters! Will the 0 to 100 milliammeter in series with the 12V battery slam over against the pin? Will Q1 and Q2 go West in a few milliseconds? Will a dull silence come out of the loudspeaker? However, the moment a few mils show steady, my nerves settle down and I'm good for hours of alignment, gain-setting, testing, etc.

This one came on right away, tuned up fine, and only needed a little jiggling of the value for R1 to behave perfectly.

After everything is running, proper avc, good adjustable gain and af output, and the frequency centered on 1.65 MHz, the baseboard can then be mounted in the box and the wires soldered back onto the jacks and control. One final operating check and tuneup in the box and there you are.

The complete circuit is shown in Fig. 8, and it's a good one.

Conclusion

This little box replaces another breadboard in the 432'er receiver, and also makes a good general purpose i-f around the shack. . . . K1CLL

Gabe Gargiulo WA1GFJ
17 Whitney Street
East Hartford CT 06118

HOLD ON TO THAT RIG!

While looking through the ham ads recently I was stunned to see at least three ads of equipment for sale, with the excuse of "college expenses." Now just a minute! How much do they expect to get for a used station? $1,000? $2,000? It would have to be some station to sell for that much, second hand. And how far would one or two grand go in college? It might pay the tuition for one year in a small percentage of colleges. Selling a station when you need cash is not the answer.

I was greatly tempted a few years ago to sell some of my equipment (Swan 500C, Swan 400, Gonset GSB 2, two'er, D104 mike) simply because I needed the money due to marriage, bills, and a baby, all of which cost more than any college.

But, being a true ham, I kept convincing myself to hold on to that radio gear – things were bound to get better. They did, thanks to a programming job, and now I am back on the air and into 2 meter FM. If I had sold all my gear, I would still have the bills, but no rig, and a sorry ham I would be!

Look at it from a financial point of view. Sooner or later you will get out of your financial difficulty and will need to get back on the air. Then you will have to buy all new gear, which will cost you much more than you got for your old equipment. If you had taken out a loan when you needed the money, you would be ahead of the game (and still have your rigs).

Have you ever found out how much you can get for your old rigs? I did. A local distributor offered me $75 for my Swan 400 that I bought for about $450 in 1967. I was offered the same for my GSB 2. It's not worth it to sell them.

So, whatever the reason you are thinking of selling out, don't. You will get over the financial crisis and the ham radio bug will bite you again. If you don't need the money and have just lost interest in ham radio, don't sell out. Why not let someone benefit who is still interested in it? How about letting a teenager borrow it, or giving it to a radio club or to someone in DX-land?

Don't get out of ham radio – you may regret it if you do – but you'll never regret it if you stay with it.

. . .WA1GFJ

R.C. Altman WA6AXV
1053 Shrader Street
San Francisco CA 94117

IT'S A CALL

QST, QST, QST—Our new WR call has arrived." Thus our trustee, WA6AGA announced the event Tuesday afternoon, June 26th, just 5 days before the July 1 deadline, and 3 days before the announcement from the FCC of a 60 day extension.

I'm sure the members felt almost as they might have at the announcement of the uncomplicated birth of a son. After months of trying to meet FCC's complicated requirements for a repeater license (and 2 submissions), the best repeater in all of Six land, WB6AAE, had its new WR call. The trustee, Al Nielsen, first thought not even to open it, "let's have an unveiling ceremony," but his curiosity got the better of him, plus he decided having the new I.D.er wheel ready would make a better ceremony. One member promptly organized a pool of guessing the new call at 10c an entry, to be mailed to him not later than Saturday June 30. Pay-off to be at next club meeting July 27th, thus allowing for slow mail delivery.

Al immediately contacted the program chairman WB6GWQ Roy and said, "devise some kind of ceremony—probably upon the hill at the repeater site for this Sunday for a change of call."

Being one of the top program chairmen in the country, he immediately threw his hair-trigger brain into gear, phoned a brace of members for assistance, and pulled off another of his brilliant schemes. With plenty of on-the-air publicity during the next 5 days, we had 55 people up on the hill for the ceremony to take place at high noon on July 1.

A committee of two was picked to design a special QSL to be issued to any check-ins during the first 8 hours of operation under the new call. Tape recorders were hooked up to record the requests. Champagne and hot dogs were purchased, movie cameras were arranged for—a bed sheet was requisitioned for a banner—sprayed on it ahead of time was "WR6 " and the big day arrived. Beautiful weather, bright, not a cloud in the sky—perfect! The program chairman Roy tried to take credit for that too.

Beginning about 9:00 a.m. the trek was on from all over the San Francisco Bay Area. Many of the members even had breakfast together and went up into the Berkeley hills in a caravan. Some members drove 50 miles one-way from San Jose to be there.

The banner was strung up, ready to be raised on high, the hotdog broiler was plugged in and cooking, the champagne was on ice. Two of the more rotund members settled a long-standing argument as to which one could squeeze into the narrow space· behind the repeater cabinet (they both did—so we still don't know which one is heavier).

A public address system was set up because only about 6 or 8 people could crowd into the shack to witness the changing of the I.D.er wheel, a running commentary was being given over the repeater by Little John WA6TKP, for the benefit of all not able to be there. Final entries into the dime pool were filed along with their guess at what the new call would be.

A little bit of history of the repeater was

announced over the p.a. system and over the air. It was first put on the air in 1962, first meetings were held in whose living room, and now we have 155 paid-in members, etc.

At 11:55 a.m. the last I.D. of WB6AAE went out over the air automatically, the wheel was removed, to the sound of taps bugled by Antioch John WA6ENM, the new wheel was installed and we waited—and waited—actually only about one minute, but it seemed like hours, then there it was—WR6ABM! Promptly as 12 noon, July 1, 1973. Antioch John promptly blew charge and shouts went up, ABM was sprayed on the bedsheet banner and it was raised about 30 feet into the air with feelings similar to those when you see the Stars & Stripes in a solemn moment. The air was filled with many many calls all at the same time, everybody listening trying to be first on the repeater with its new call. To listen to the tape now, it was mass bedlam, but in a minute they started settling down and calling in—in a more orderly fashion, placing their call and address on the tape for their request for the new QSL card. The last time I heard the total count—210 names and addresses were recorded.

Up on the hill, champagne corks were popping as much as 20 feet into the air. Everybody there had champagne and over 200 hotdogs were consumed in 30 minutes.

The trustee, Al Nielsen, WA6AGA was showered from behind with champagne as he retired the old wheel into what was called a cavity, but sure resembled a wastebasket, and burned.

One member, Lou WB6TXD surprised all of us by bringing a beautiful cake decorated like a birth announcement that said "IT'S A CALL." Movies of the entire proceedings were made by Sunset John WA6DPJ and shown at the next meeting, for the benefit of those that couldn't be there. He did a beautiful job of editing the film.

The dime pool contained $1.90 since we only had 5 days to publicize it, and was won by Clem WA6AVM. He picked the correct call because of his own call. A good time was had by all!

... WA6AXV

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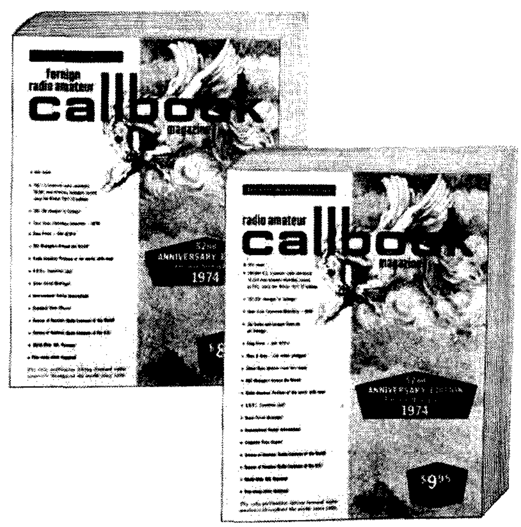

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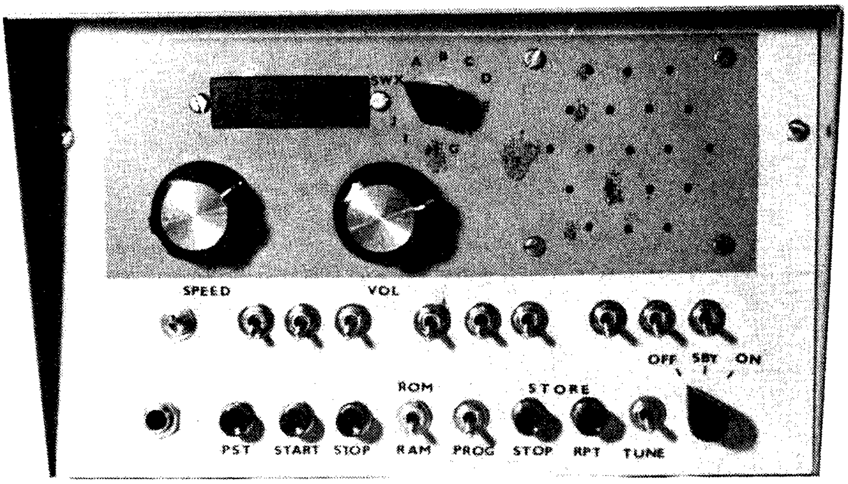


MOSKEY

A PROGRAMMABLE IAMIC CMOS KEYER

Part 2

Part of this article published in the June issue of 73 described the basic keyer portion of MOSKEY. In Part II I will describe how the memory circuit works and how Morse code is encoded to obtain high density storage in memory.

Memory Coding Scheme

A considerable amount of time was spent to determine the most efficient way to store the code into the memory to conserve memory space. When MOSKEY was first designed the largest static RAM available was a 256 bit TTL RAM. Just a 3 by 3 CQ sent twice would use up 680 bits of memory. Having only 4 RAMS, 1024 bits of memory, on hand, that didn't leave much room to program in other phrases. I decided the repeat capability was a must and began to look for a way to more efficiently store the code in memory. Now with 1024 bit static RAMs available memory space is not so much of a premium, but the same coding scheme is used here as originally designed. The simplest way to store the code is to sequentially store 1's and 0's in memory, with a 1 representing an output, and a 0, no output. The letter "A" would be stored as 10/1110. CQ with letter and word spacing would be stored as 1110 /10 /1110 /10 /00 /1110 /1110 /10 /1110 /000000/ using 34 bits of memory. One method to conserve memory space would be to store only 2 ones in memory for a dash, instead of 3 ones, and let the keyer automatically fill in the third time unit when sending a dash. Likewise only 2 zeros could be interpreted as a letter space, again letting the keyer fill in the missing space unit. A word space could be stored as 3 zeros in sequence and the keyer could lengthen it out to a 7 unit word space. CQ would then look like this 110/10/110/10/0/110/110/10/110/00/ using a total of 24 bits of memory space. Since there are only four instructions to be stored in memory: a dot, a dash, a letter space, and a word space, I decided that storing a two bit op-code, like a computer instruction, could be decoded into the four instructions. The op-code is read out of memory two bits at a time and decoded to control the keyer. The memory actually consists of 2 memory ICs operating side by side, with one op-code bit coming out of

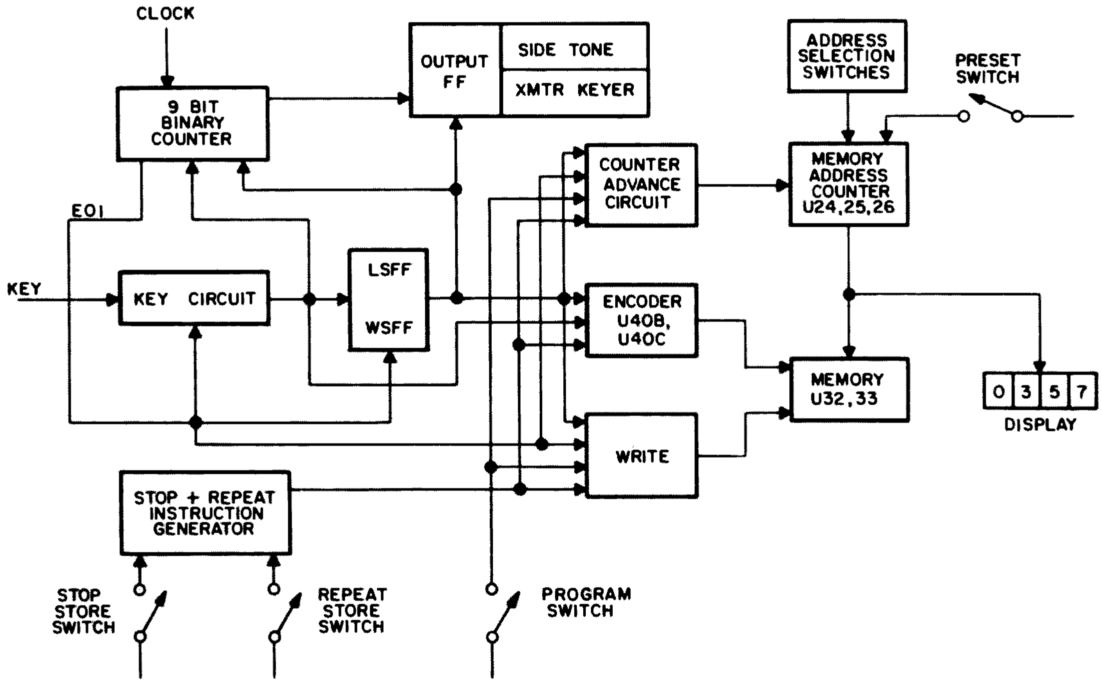


Fig. 6. Signal flow for programming memory.

memory A, and the second op-code bit coming out of memory B. Let the op-code assignment be the following:

OP-CODE BIT A	OP-CODE BIT B	CHARACTER
0	0	Word Space
1	0	Dash
0	1	Dot
1	1	Letter Space

Then CQ reduces to the following:

AB AB AB AB AB AB AB AB AB AB
10 01 10 01 11 10 10 01 10 00

using only 20 bits of memory. This is the way MOSKEY stores code in memory. MOSKEY is capable of storing 1024 characters, a character being a dot, dash, letter space, or a word space. The memories are 1024 bit N-channel MOS devices. They are CMOS compatible if the CMOS is operated at 5V. They were priced in the $70 range when first introduced a year ago, but have come down to $12 to $15 each now. Hopefully they will drop in price even more as the price of CMOS devices continues to decline.

Programming Memory

Figure 6 shows the block diagram of the keyer with the additions necessary to program memory. The encoder circuitry encodes dots, dashes, letter spaces, and word spaces into the proper op-code for storage in memory. The memory address counter is a 10 bit binary counter which sequentially accesses the 1024 locations of memory. After each instruction is written into memory the memory address counter is incremented by one.

The keyer is placed in the programming mode by turning on the PROGRAM switch. The memory address counter can be preset to any starting location by selecting a number on the address switches and pressing the PRESET button. This permits sequences to be stored anywhere in memory. The counter will start from the location it was preset to and continue from there. The sequence desired is loaded into memory by simply sending it on the key. As each dot, dash, letter space, and word space is sent, it is encoded and stored into memory by the write circuitry. When no further entries are made from the key, the keyer will store the word space into memory and enter the idling mode. Long gaps between words are not programmed into memory. Specific combinations of op-codes (to be discussed later) are used to program a stop instruction or a repeat instruction in memory. This is accomplished by pressing the stop store switch or the repeat store switch. The instruction will be written into memory and the memory address counter advanced by 1.

The display is used to see what location in memory is currently being used. By jotting down the starting location of each sequence programmed in memory, you can preset the address counter to that location and have the keyer send any one of several sequences stored away.

When programming memory, as each dot or dash is sent from the key, during the last bit time of the space following the dot or dash, when EOI is high, CLOCK 2 generates a write pulse to the memories and stores the op-code in memory. A new character is then started from the key. EOI DELAYED BAR is low during the first bit time of the new character and is an enable to advance the memory address counter at this time. The memory is then ready to have the next op-code stored into it during the last bit time of that character. When no further entry comes from the key, the keyer enters the letter space mode. During the last bit time of the letter space the op-code is stored in memory. Now comes a decision. If a key entry comes along, then it was really a letter space and the memory will be advanced during the first bit of time of the dot or dash being sent. If no key entry occurs then the keyer enters the word space mode to time out 4 more spaces. The memory is not advanced this time and during the last bit time of the word space the word space op-code is written over top of the previously stored letter space instruction. Then the memory is advanced during the next bit time. When the keyer is idling no writing or advancing of the memory takes place.

Sending From Memory

Figure 7 shows the signal flow for reading code out of memory. The starting location of the sequence is selected by the address switches and loaded into the memory address counter by pressing the PRESET switch. The counter will count up from this location as the code is sent from memory. Pressing the START button starts the keyer and it will send code until a stop code is reached, or it is stopped manually by pressing the STOP button. The op-code decoder decodes the memory outputs into dot, dash, letter space, or word space commands. After

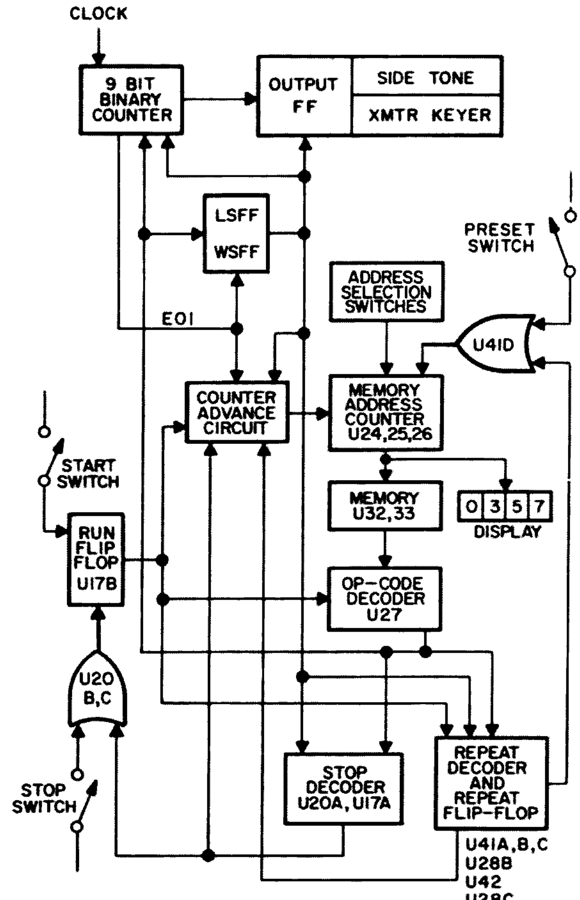
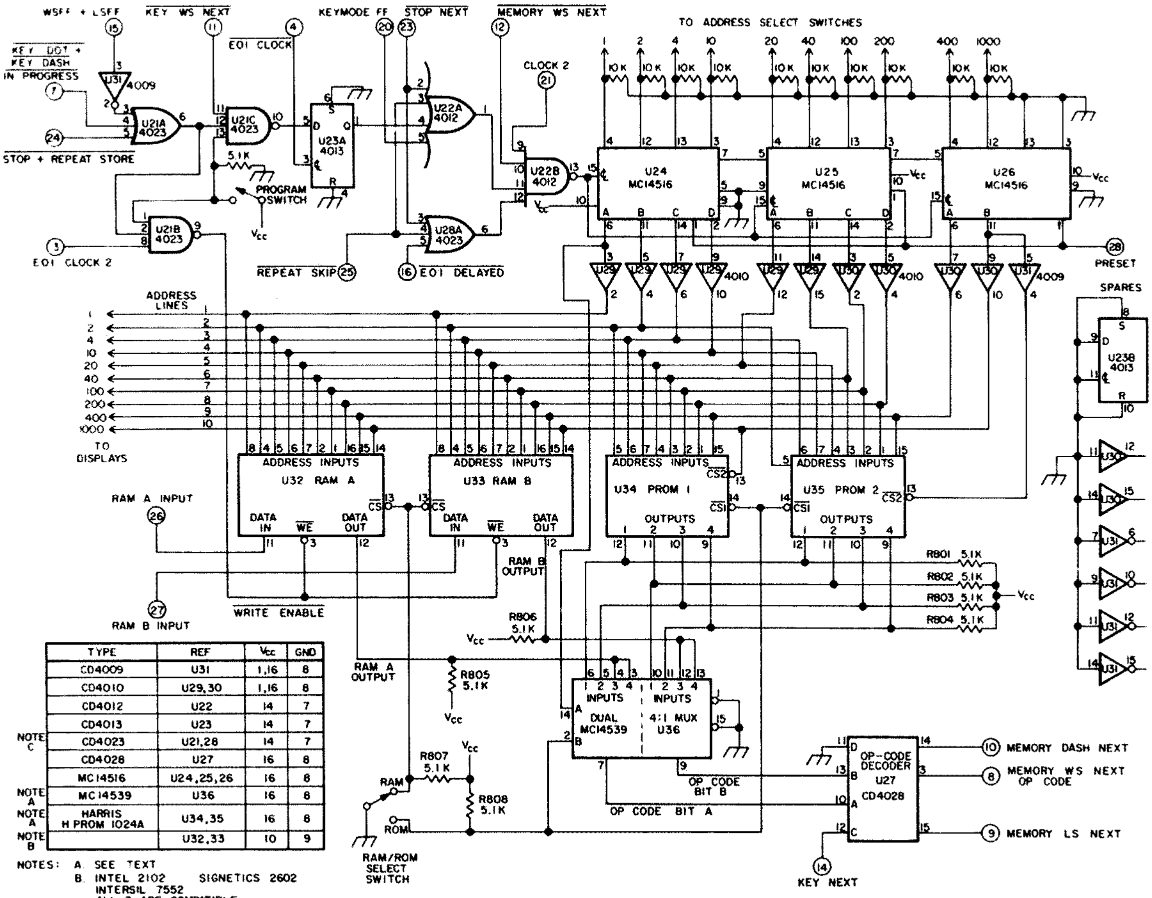


Fig. 7. Sending code from memory.

the keyer starts each new character the memory address counter is advanced during the first bit time of the character so that the next character to be sent is available. Since the keyer is self-completing, once a character has started, the next character to be sent can be read from memory, be decoded, and be waiting for the keyer to use it upon completion of the current character.

The word space instruction is really a two phase instruction. It must generate a 6 unit space. When a word space instruction is decoded from memory the keyer first enters the letter space mode and the memory is not advanced. With the word space instruction still valid and LETTER SPACE FF high, the keyer then enters the word space mode and advances the memory. The control logic is more complicated with this scheme but the maximum amount of code that can be stored in memory is utilized.

For those of you who peeked ahead to Fig. 8, the memory dot output of the op-code decoder is not used. It is implied that if the RUN FF is set then the keyer has to at a minimum send a dot. RUN BAR is



NOTE	TYPE	REF	Vcc	GND
	CD4009	U31	1,16	8
	CD4010	U29,30	1,16	8
	CD4012	U22	14	7
	CD4013	U23	14	7
NOTE C	CD4023	U21,28	14	7
	CD4028	U27	16	8
	MC14516	U24,25,26	16	8
NOTE A	MC14539	U36	16	8
NOTE A	HARRIS H PROM 1024A	U34,35	16	8
NOTE B		U32,33	10	9

NOTES: A. SEE TEXT
B. INTEL 2102 SIGNETICS 2602
INTERSIL 7552
ALL 3 ARE COMPATIBLE
C. 2 SECTIONS OF U28 USED IN FIGURE 13

Fig. 8. Memory section of keyer.

used to keep the counter enabled, Fig. 3. The dot decode is not used, so if the keyer is sending from memory and no outputs of the op-code decoder are high the keyer sends a dot. A dash decode makes the counter count longer for a dash; a letter space decode is really a dot with the output inhibited; and a word space decode is a letter space sequence followed by a word space sequence.

PROMS

Figure 8 is the schematic of the memory section of the keyer. The memory address counter advance circuit is also included. U24, U25, and U26 are the memory address counters. Most CMOS devices cannot drive a TTL load so U29 and U30, non-inverting buffers, are used to increase the drive capability for addressing the TTL PROMS and driving the displays. U34 and U35 are the optional PROMS installed in the keyer. They are 256 word by 4 bit PROMS. U36 is a dual 4 to 1 multiplexer needed to select the proper PROM outputs. If you decide not to use the PROMS, U34, U35, and U36 can be eliminated Also R801 through R804 can be eliminated, as well as the RAM/ROM select switch and R807 and R808. Then connect RAM A OUTPUT U31 pin 12 directly to OP CODE BIT A U27 pin 10, and connect RAM B OUTPUT U33 pin 12 directly to OP CODE BIT B U27 pin 13. Resistors R805 and R806 must be left installed. Ground the RAM chip selects U32 and U33 pin 13.

Since the PROM is organized as 256 words by 4 bits a multiplexer is needed to select two op-code bits at a time. Figure 9 shows a simplified schematic of how this could be done. Assuming a sequence starts at location zero, all the address lines will be at a logic zero. The PROM will have the four data bits for its word zero at its outputs. Address line 1 is a select input to the 2:1 multiplexer and address lines 2 through 9 are used to address the PROM. PROM output 1 is selected by the multiplexer and appears as op-code bit A, and PROM output 2 appears as op-code bit B. The keyer uses this to start sending the first character and then advances the address counter to make address line 1 go high. This causes the multiplexer to now

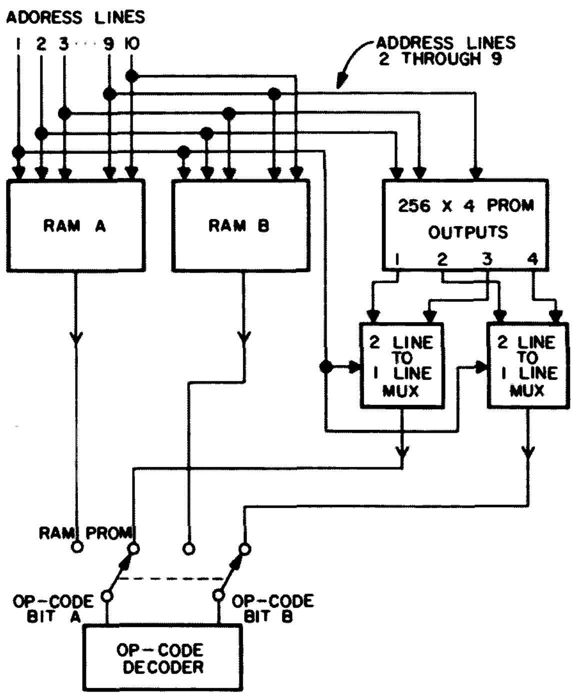


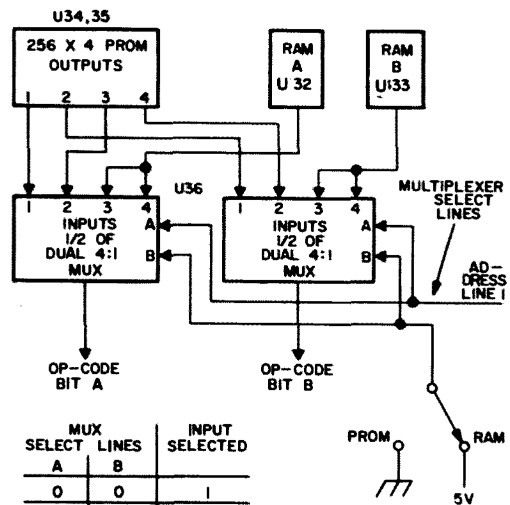
Fig. 9. A method to select 2 op-code bits at a time from PROM.

select PROM output 3 as op-code bit A and PROM output 4 as op-code bit B. This becomes the second character for the keyer to send. When the keyer starts sending the second character address line 1 goes low and address line 2 goes high. This now selects the second 4 bit word of the PROM and causes

Address Lines 10	9 8 7	6 5 4	3 2 1	Location shown on Display	Actual Decimal word of Prom used	Output Bit of Prom used as op-code Bit A	Output Bit of Prom used as op-code Bit B
0	0 0 0	0 0 0	0 0 0	0000	0	1	2
0	0 0 0	0 0 0	0 0 1	0001	0	3	4
0	0 0 0	0 0 0	0 1 0	0002	1	1	2
0	0 0 0	0 0 0	0 1 1	0003	1	3	4
0	0 0 0	0 0 0	1 0 0	0004	2	1	2
0	0 0 0	0 0 0	1 0 1	0005	2	3	4
0	0 0 0	0 0 0	1 1 0	0006	3	1	2
0	0 0 0	0 0 0	1 1 1	0007	3	3	4
0	0 0 0	0 0 1	0 0 0	0010	4	1	2
0	0 0 0	0 0 1	0 0 1	0011	4	3	4
0	0 1 1	0 0 0	0 0 0	0300	96	1	2
0	0 1 1	0 0 0	0 0 1	0301	96	3	4
0	0 1 1	0 0 0	0 1 0	0302	97	1	2
0	0 1 1	0 0 0	0 1 1	0303	97	3	4
0	0 1 1	0 0 0	1 0 0	0303	98	1	2
0	0 1 1	0 0 0	1 0 1	0305	98	3	4
0	1 1 1	1 1 1	1 1 0	0776	255	1	2
0	1 1 1	1 1 1	1 1 1	0777	255	3	4

Fig. 10. Table to help illustrate how address lines are related to number shown on displays, and actual word of PROM used.

the multiplexer to go back to selecting PROM outputs 1 and 2 as the op-code bits. Each word of PROM contains two characters of code. Figure 10 helps to illustrate how the PROM addressing works. The RAM/PROM select switch could be another dual 2:1 multiplexer. Since dual 4:1 multiplexers are available these two functions can be combined in a single IC and Fig. 11 shows how this is accomplished.



MUX SELECT LINES A	B	INPUT SELECTED
0	0	1
1	0	2
0	1	3
1	1	4

Fig. 11. The way MOSKEY multiplexes the PROM outputs and selects between PROM and RAM.

There are many versions of Programmable Read Only Memories (PROM) on the market, two of the more popular types being 256 words X 4 bits, and 32 words X 8 bits. These are manufactured with all 1's or all 0's stored, depending on the manufacturer and type. They can be programmed by applying proper voltages and pulses and any sequence up to the capacity of the PROM could be installed in MOSKEY. Once they are programmed, they cannot be changed back again. The PROMs contain nichrome fuse links in each memory cell which are safe against being blown out under normal operating conditions. With the proper voltages and current pulses applied the link in each desired cell can be melted open, or blown like a fuse, and the logic state of that cell changed. If you decide to install a PROM in your keyer give it a good hard look before committing to a sequence. Check and double check it several times as mistakes cannot be corrected. I do not recommend

trying to program a PROM by yourself. It's too easy to make a mistake with so many bits to program and the exacting step by step sequence that must be followed for each bit. If you decide to use a PROM let the parts store program it for you. Some charge a small fee, and others will do it free. With the large memory size available in the keyer, and the ease of programming it, one might consider that a PROM is not really necessary at all. However the RAM is a volatile device which means that when the power is removed the contents of the RAM are lost, and without a PROM your favorite saying will have to be reprogrammed each time the keyer is turned off.

Figure 12 shows how 32x8 PROMS could be implemented. Loading of the address lines must be watched. The 3:8 decoder could be a 7442 TTL chip or 4028 CMOS chip with inverting buffers used after it.

Stop and Repeat Instructions

Figure 13 shows the schematic of the stop and repeat instruction generators, the repeat circuit and the op-code encoder. With the coding scheme used in MOSKEY it may have become obvious by now that letter space instructions can only be followed by dot or dash instructions, and likewise word space instructions can only be followed by dot or dash instructions. Up to four special control instructions could be implemented by storing two letter spaces in a row, or a letter space followed by a word space, or two word spaces in a row, or a word space followed by a letter space. MOSKEY uses two of these combinations to generate stop and repeat instructions. After the last dot or dash entered from the key is encoded and stored into memory, the keyer generates a word space op-code, stores it in memory, and then idles. By using a manual switch closure to enter a letter space or word space op-code into memory in the next location, it will be interpeted when sending from memory as a STOP or REPEAT instruction, respectively. This is done by pressing the stop store switch or the repeat store switch while the keyer is idling. The instruction will be written into memory and the address counter advanced one location. Switch de-bouncers and synchronizers are used on

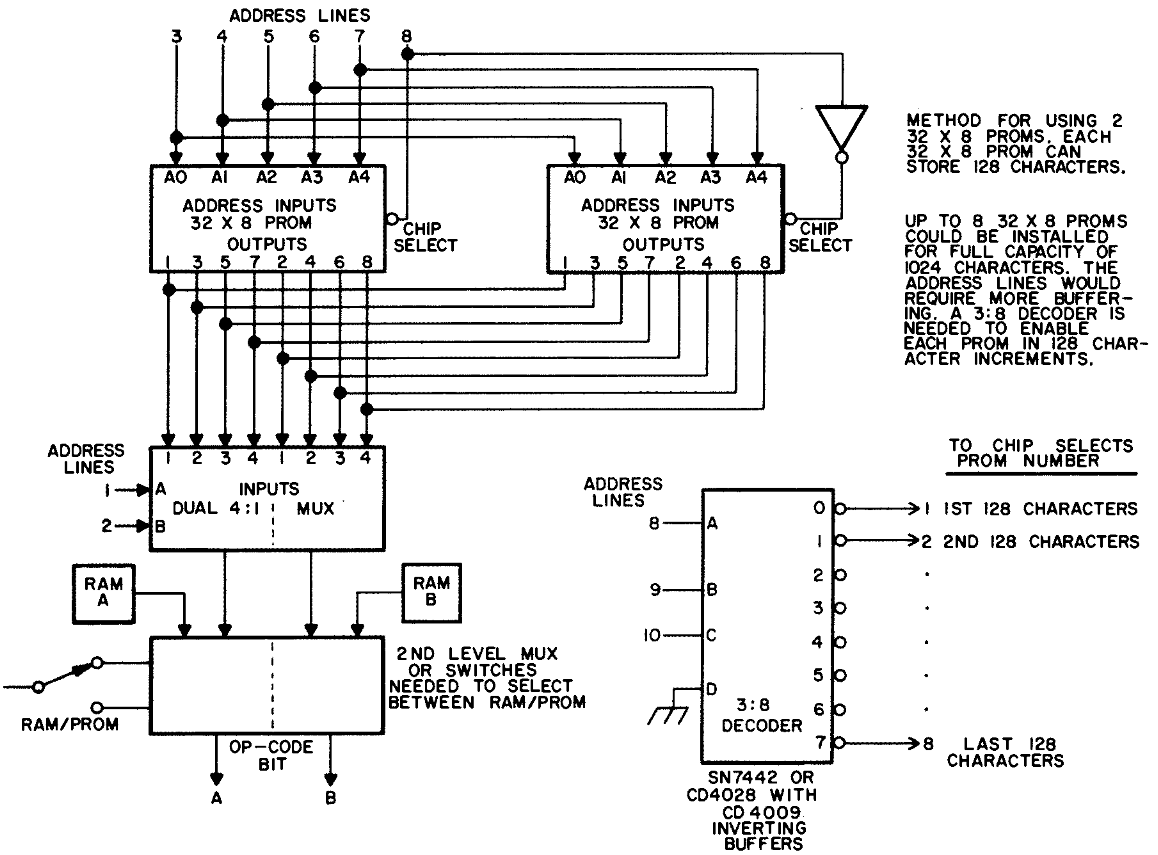
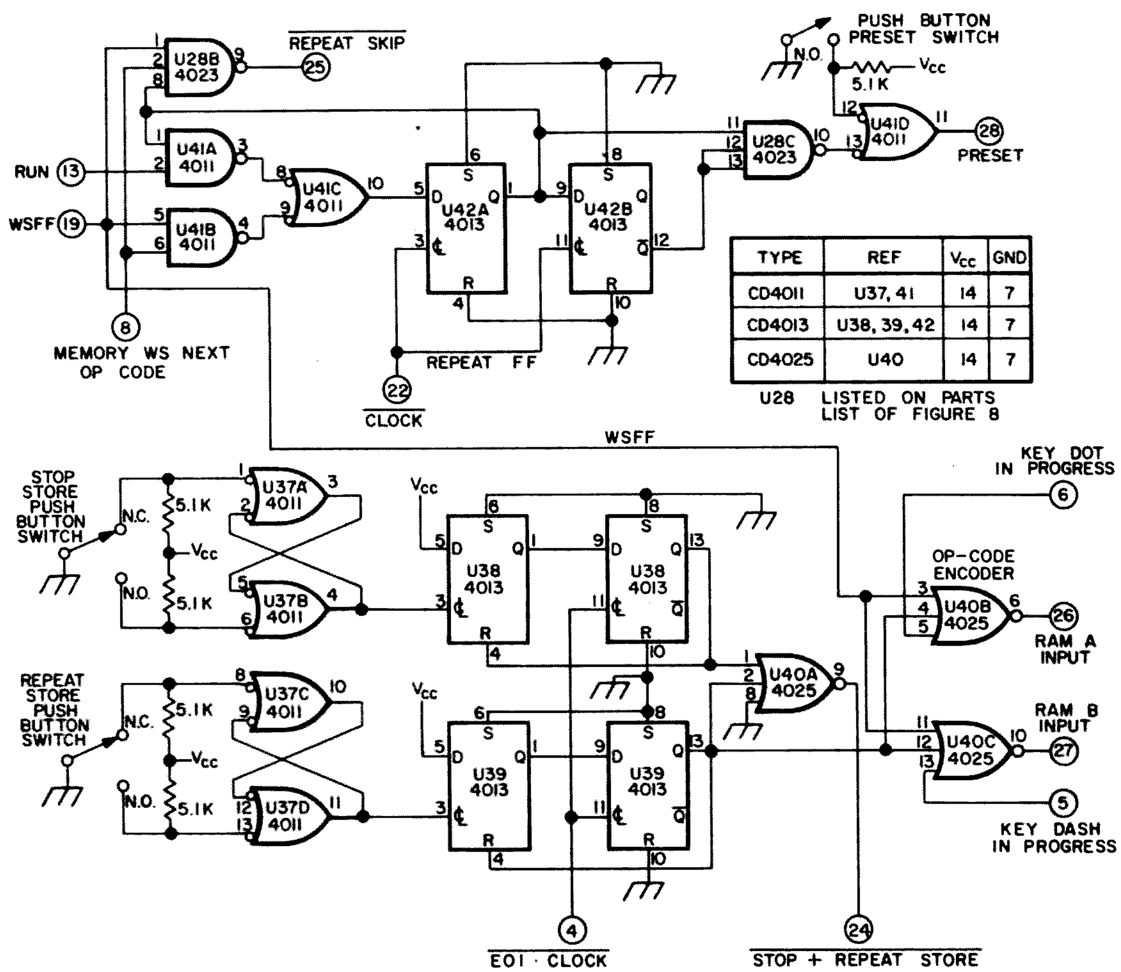


Fig. 12. How to implement 32 x 8 PROMS in Moskey.



TYPE	REF	V_{cc}	GND
CD4011	U37, 41	14	7
CD4013	U38, 39, 42	14	7
CD4025	U40	14	7

Fig. 13. Schematic of repeat decoder and stop and repeat instruction generator. Also the op-code encoder.

the stop and repeat store switches so that a single pulse synchronized to the keyer clock is generated by each switch closure.

The repeat flip-flop is reset when not sending from memory. When sending from memory and a repeat instruction is decoded the memory address counter will be preset to the number selected on the address switches, which should be the starting address for the sequence being sent. The repeat flip-flop will also be set. The keyer will return to the beginning of the sequence and send it again. When the repeat instruction is reached again the second time through the sequence, the repeat instruction is ignored. The memory address counter is advanced one more location skipping over the repeat instruction to that the keyer has the next valid dot or dash instruction ready for when it is needed. (The keyer is self-completing a word space at the time the repeat instruction is decoded and inputs to the 9 bit counter, the dot, dash, etc., generator are being ignored until the end of the character, so the memory advance circuit in the keyer can advance the memory beyond the repeat instruction and not cause any abnormal operation in the keyer. All characters will still be perfectly timed.) It is permissable to have a stop instruction immediately after a repeat instruction and it will cause the keyer to stop after the second pass through the sequence. As an example of how the repeat instruction can be used I have the following sequence stored in my keyer: CQ CQ CQ DE W1GCA W1GCA W1GCA (repeat) K (stop). When sent from memory it comes out as: CQ CQ CQ DE W1GCA W1GCA W1GCA CQ CQ CQ DE W1GCA W1GCA W1GCA K (stop).

The conclusion of this series will discuss the sidetone, transmitter keyer, power supply and displays. The spare gates indicated in Figs. 5 and 8 will be used for the sidetone and transmitter keyer.

. . . W3HPX

Gary L. Tater W3HUC ex K1YLU
7925 Nottingham Way
Ellicott City MD 21043

OSCAR 7

With One Receiver

After reading the fine technical articles on preparing for OSCAR 7, perhaps you are wondering how you will use all of the OSCAR 7 capabilities without:

1. Buying a new crystal for your 144 MHz and 432 MHz converters.
2. Retuning your receivers 10 meter band to include 29.975 MHz and losing 28.0.
3. Tying up several receivers.

If you have an NC-300 or NC-303 as a spare receiver at your station, here is a simple, convenient and inexpensive solution that will allow you to use both OSCAR 6, OSCAR 7, and the low end of 144 and 432 MHz bands without adjusting or changing crystals in the equipments.

The downlink signals for the two satellites are listed in Table 1, along with receiver requirements for 28 MHz i-f VHF converters. Very few ham band receivers cover frequencies above 29.9; however, the NC-300/303 series has a converter band that begins at 30.0 MHz.

Fig. 1, shows an NC-303 configured to monitor all three of the OSCAR 7 downlinks and beacons using the receiver band switch and one external coaxial switch. The only modification necessary is to tune the capacitor in the NC-303's converter band local oscillator such that 29.9 MHz is received at the 143.5 MHz (30.0 MHz) dial calibration. This should be accomplished with the receiver in its cabinet. At this time you should also adjust the air trimmer in the rf amplifier by using the crystal calibrator as a signal source.

I do recommend the use of a good solid state 10 meter preamp as shown in Fig. 1. An additional coaxial switch could be used to return the converters to the 10 meter input for a complete satellite, 432 and 2 meter station in one receiver.

...W3HUC

TABLE 1

OSCAR 6 and OSCAR 7 input, output, beacon and station receiver requirements.

	UPLINK (MHz)	DOWNLINK (MHz)	RECEIVER (28 MHz IF)
OSCAR 6	145.9-146.0	29.450-29.550	29.450-29.550
BEACON		29.450	29.450
OSCAR 7	145.850-145.950	29.40-29.50	29.40-29.50
	432.125-432.175	145.975-145.925	29.975-29.925
BEACONS		29.5	29.50
		145.98	29.98
		435.1	31.1

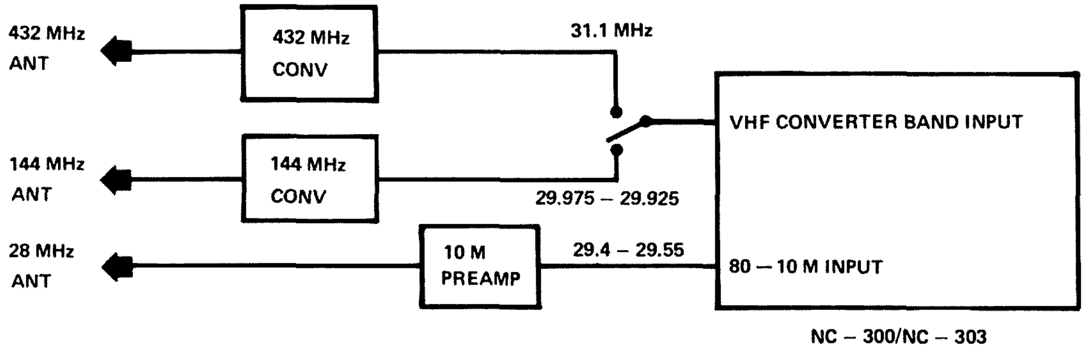


Fig. 1. A single receiver for satellite use.

73 Staff

HIGH OUTPUT ACCESSORY MICROPHONE

Frequently with either an SSB or FM rig the built-in microphone amplifier does not produce sufficient gain to achieve full modulations when used with an existing microphone. There are several obvious solutions to this problem but while either the technical or economic aspects are being solved, one might consider the use of the auxiliary microphone described in this article. Its output level is variable and can exceed that of a dynamic microphone used with a microphone preamplifier. The cost is extremely low and yet it has a very good speech-engineered response. Needless to emphasize, it is extremely rugged and durable.

Before going too far in describing the virtues of this microphone, it should be pointed out that a carbon type microphone is the theme of this article. Before discarding the idea because carbon type microphones evoke memories of old, noisy, telephone-sounding instruments, one should consider that even carbon microphone technology has advanced in recent years. No suggestion is made that one use any of the old war surplus type carbon microphones. However, the newer telephone type carbon microphone elements, and particularly those developed for use in private telephone-type intercom systems, are definitely good speech quality units that proudce a minimum of noise. Listen carefully once to a modern telephone type unit and the audio quality it provides. The particular carbon type element shown in this article is an imported type used in intercom systems but any of the new replacement types available from microphone manufacturers should provide an equal or better level of performance. (Fair Radio Sales, Lima, Ohio 4582 has a number of modern, excellent grade military surplus types.)

Microphone Circuit

The quality and reliability achieved from a carbon type element depends a great deal on how it is connected into a single circuit which provides a resting current through the microphone element. One fact that is immediately apparent when experimenting with modern carbon elements is that ex-

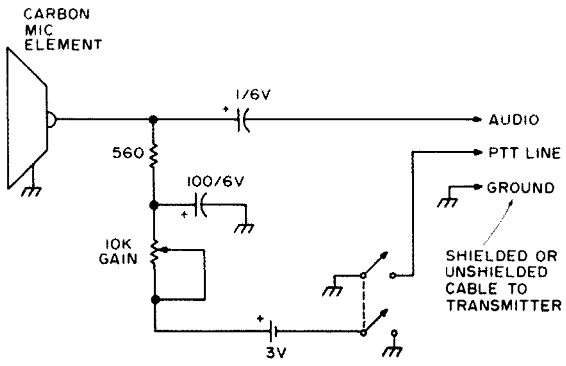


Fig. 1. Complete microphone assembly with gain control.

tremely little current has to flow through the microphone to provide a good level of output. For instance, the circuit of Fig. 1 provides a current through the carbon element (when the push-to-talk switch is activated) which is determined by the 3V battery and the series combination of the 560 fixed and 10K variable resistors. Even with full resistance in the circuit, the output level is approximately equal to that of a high output level dynamic microphone. This represents a current of less than 1 mA and was one reason, as described later, why the batteries for the microphone were placed in the microphone enclosure. Under normal usage, their life will approach shelf life. The 100μF bypass capacitor isolates the 560Ω resistor as the terminating af impedance for the microphone elements. This resistance value can be varied up to several thousand ohms if it is found that doing so provides a better match or output level when used with a particular amplifier. The push-to-talk switch simply activates the normal push-to-talk line for a transmitter as well as completing the battery circuit for the microphone during transmit.

Since the microphone circuit is inherently a low impedance circuit, one does not absolutely have to use shielded cable to the transmitter although it is recommended. One thing that will be immediately obvious is the lack of problems that occur with rf feedback when using the microphone. It is quite a contrast to the situation that usually occurs when one uses a low level output microphone and an accessory preamplifier external to a transmitter.

Construction

The microphone along with its batteries can be enclosed in almost any simple enclosure that can accommodate the volume of the components. The enclosure need not be a metal unit. I simply used a clear plastic box (later painted black) which measured about 2x3x½ in. and provided a comfortable "feel" when hand-held as a microphone enclosure. A number of holes were drills in the enclosure in a more or less circular pattern where the microphone face would press against the enclosure. A thin foam plastic sheet (or grill cloth) should be placed in the enclosure behind the holes to act as a moisture and wind screen.

The mounting of the rest of the components is simply a matter of convenience. The only component that one might want to check the mounting of carefully is the push-to-talk switch. Strangely enough, many people who are normally right-handed will hold a microphone in their left hand and a mounting for the switch in the upper right hand portion of the enclosure will prove the easiest to use. I used regular AA batteries but the current drain is so low, button type batteries can be used and the enclosure size reduced even further. The 10K variable resistor was brought out on the back panel of the enclosure with a screwdriver slot shaft as a convenience when making tests.

Summary

The simple microphone described was not intended to replace more expensive dynamic units and aside from its high output no claim will be advanced that it sounds better than an expensive dynamic microphone. However on the air tests have shown that it does sound as good as inexpensive dynamic units intended for speech usage and, of course, far superior to cheap tape recorder dynamics for speech purposes. The output level can be adjusted to *at least ten times* that provided by a dynamic microphone and the whole assembly provides an ideal interim solution to the problem of working with a transmitter that requires an unusually high microphone input level or with FM stations or repeaters that require varying deviation levels.

. . . **73 Staff**

Walter W. Pinner WB4MYL
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Louisville KY 40228

A High Power Low Pass Filter

The construction of a low pass filter capable of handling maximum legal power levels is usually complicated by the following factors.

1. Most construction articles describe units for 250 watts or less.
2. Filters for higher power levels require special capacitors which are not readily available (not to mention cost).

tors is. This filter is designed for use in 52 ohm lines, but any standard filter may be built by applying the capacitance value of the board per square inch and calculating the box size accordingly. The capacitance of 1.5mm (1/16") double clad board was measured at 14 pf per 6.5 sq. cm. Phenolic or epoxy measured essentially the same. 2mm (3/32 in.) board measured 8 pf per 6.5 sq. cm.

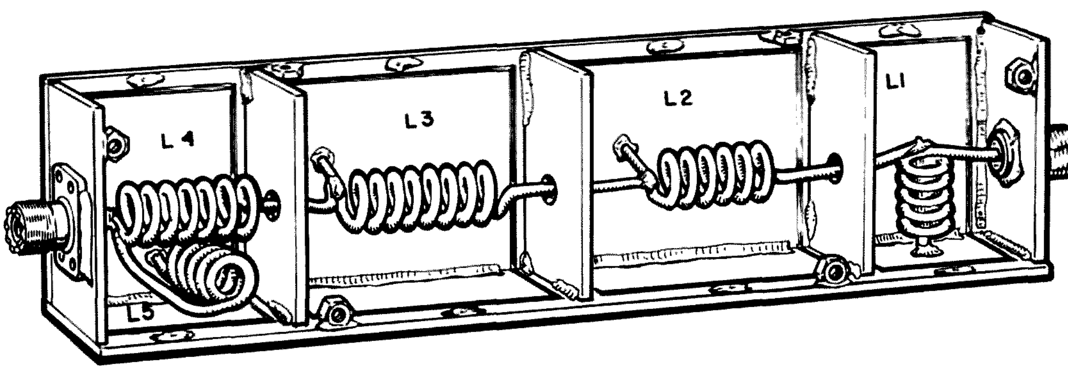


Fig. 1. Pictorial view of the low pass filter. It is built entirely from double sided copper clad stock, with etched out sections of the board serving as capacitors.

3. The physical size of such capacitors increase the over-all size of the unit, if variable, require equipment for alignment and usually will not lend themselves to following the original layout.

The filter described herein requires *no* capacitors, double-sided copperclad board is used as the capacitive elements. If the dimensions are followed NO alignment is necessary, and the overall size is *small* 5x5x24.5 cm.

The materials needed for construction are, double clad copper board 1.5mm (1/16"), #10 solid copper wire and 2 SO-239 connectors.

The circuit for this filter is not new, but the use of copper clad board for the capaci-

A line drawing of the low pass filter is shown in Fig. 1. There are four shielded compartments. The inside walls of each section form one plate of the capacitor with the outside of the box forming the other plate.

The box ends, dividers and foil track are all at ground potential. Fig. 2 shows the electrical circuit of the filter. The copperclad board parts are all soft soldered in place. Fig. 3 is the dimensional drawing of the board which makes up two sides of the box. The .3cm (1/8") cm wide insulating tracks may be etched or cut using a hobby or carpet knife and the foil peeled away. The board is then cut in half, the cut ends filed to a 45 degree angle and the two halves

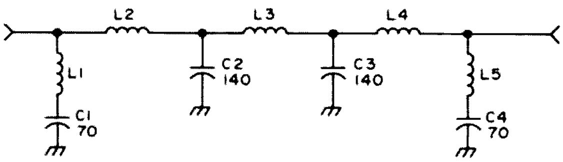


Fig. 2. Schematic of the filter. All coils are #10 copper 1.2cm (½") inside diameter. L1 and L5 are 5T, 2cm (¾") long; L2 and L4 are 6T, 2.4cm (1") long; L3 is 8½T, 3.8cm (1½") long.

soldered together being sure to solder both the inside and outside surfaces. The method of bonding the inner ground track and the outer surface together is via a number of holes drilled through the board with pins or wires passed through and soldered to each copper surface. The shields can also be made of copper clad with (.6cm) holes bored through their centers for coil connections.

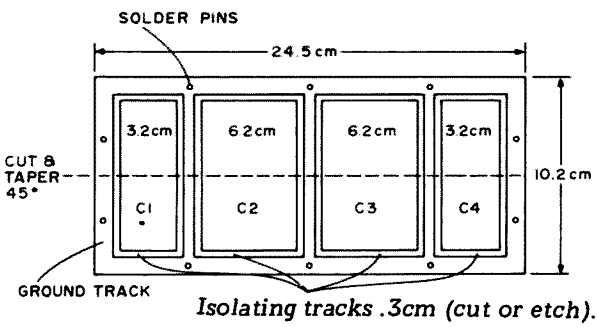


Fig. 3. The capacitors are formed by etching isolation tracks around sections of foil.

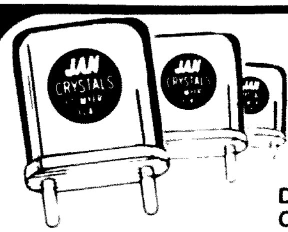
The cover may simply be light weight aluminum bent at a 90 degree angle and holes drilled to line up with the mounting nuts soldered to the inner ground track. Wind the five coils from the table below and solder them into the box using Fig. 1 as a guide to positioning. Install the cover and hook-er up. The filter I constructed worked fine when 1200 watts were run through it into a 50Ω dummy load. No increase in swr was noticeable. The frequency cut-off is at 30 MHz, with the attenuation falling sharply to 40 MHz.

. . . *WB4MYL*

COIL TABLE

	No. of Turns	Length	
L1 & L5	5 turns	3/4 in.	1.9cm
L2 & L4	6 turns	15/16 in.	2.4cm
L3	8½ turns	1½ in.	3.8cm

All coils #10 solid copper wire 1.1cm (7/16) inside diameter.



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JOB OPENING FOR PERSON
WHO CAN READ AND WRITE

Editorial Assistant for 73 Magazine

Person should be well read, particularly in electronics, and know a nor gate from a neutralizing capacitor. While not many articles in 73 are re-written, many do need attention as far as speling and grammar is concerned. Not casting any stones, but we don't want 73 to print garbage like you find in Brand X magazine.

Said job pays a lot more than it ought to, considering that New Ham Shire is one of the very best places in the whole US of A to live (ask any Californian who has had the good fortune to move to NH!). No sales tax – no income tax – rolling green hills and beautiful mountains (for DXing on VHF) – incredible 2m territory (would you believe eight repeaters on the air in NH and three more under construction!).

The A. Editor prepares articles and newspages for publication – editing them, making sure the pictures are okay, and works with the authors to make sure that everything is the best it can be.

If you are qualified and think you might like to join the gang at 73, write and tell Wayne about it.

73 Magazine – Peterborough NH – 03458

Harry Simpson W4SCF
PO Box 27015
Memphis TN 38127

IT WAS A BENCH JOB

We were scheduled to leave on vacation the next week so I took my charming red-headed helpmeet, WB4ECK, in for her 10,000 mile checkup. The Doc told us to run, don't walk across the street to the hospital for an operation. Everything came out all right (E-e-c-c-k-k!) and while she was convalescing, I asked her to tell me all about the operation.

She said, "Well, I'll try to explain in terms that you can understand. First, they removed the chassis from the cabinet and placed it on the bench. A visual inspection followed, and certain parts were suspect. This called for a closer examination of the various components.

A scope was hooked up, as was a spectrum analyzer and a VTVM. The master oscillator was checked for distortion – fortunately none was found. However, the VTVM showed a higher supply voltage than that outlined on the spec sheet, and a procedure was outlined for reducing that potential in the future.

The main difficulty was discovered in the harmonic generator, and after a conference with the shop foreman it was determined that this unit was beyond repair – and at the same time was of no importance to the overall operation, in relation to its current use. It was also decided that the parts making up this generator could continue their deterioration and damage the entire assembly if not completely removed – just as you remove dead batteries from a VOM!

After allowing an overnight cooling off period, the bench crew got down to work early the next morning while everyone was fresh, and began the conversion. In order to keep down extraneous noise – there was nothing wrong with the audio amplifier – they reduced the power to a very low level, and started to work. With all the test instruments hooked up, they cut a long slot in the shielding which enclosed the defective generator, and using diagonals and longnoses, very efficiently removed the troublesome components, and then placed jumpers in certain locations to insure proper future operation.

Following a careful visual inspection to assure themselves that they had left no tools inside the compartment, they carefully replaced the shielding, and sealed it with a slow-hardening type of epoxy. Then they gently raised the operating voltage back up to normal. Fortunately, everything worked, and the chassis was moved to a cool, quiet spot to wait for the epoxy to set.

Attached to the repair bill were instructions to cushion the device, thus protecting it from mechanical shock, vibration and bouncing, and to let it run on idling current at first, then gradually increasing the duty cycle, until finally the rated output is reached."

W4SCF: "Chee – well, if they didn't leave any cold solder joints at least you don't have to be bothered with harmonic filters . . ."

. . .W4SCF

Gabriel F. Gargiulo WA1GFJ
17 Whitney Street
East Hartford CT 06618

HAM RADIO AND FOREIGN LANGUAGES

We hams have a rare privilege. By picking up a microphone we can talk with people almost anywhere in the world. Few can afford to travel abroad, but we can all afford to visit in the living rooms of foreign hams by the magic of amateur radio.

What we say on the air can make someone's day a bit happier or it can make it a disappointment. What goes out through our antennas can affect what many people think of America.

Most Europeans think that Americans are loud, rude, free-spending, and ignorant of any language other than English.

Those of us fortunate enough to enjoy ham radio can do a lot to create a good impression of our country. We can learn the other fellow's language and talk to him in it.

By learning someone else's language we take the first step in opening our mind to him, and in communicating with him. A language is not just a way of saying things. It represents a person's whole culture, his heritage, his way of thinking, even his religion. When you learn and use his language you are saying: "Your way of life, your culture, your values are important to me. I want to be closer to you."

English is not the only language in the world. It happens to be the dominant one only because the United States is a dominant world power, and because Americans and British refuse to learn other languages. English is dominant on the ham bands because most hams are Americans, and they will not learn a foreign language.

If you decide to learn a foreign language, here are a few pointers:

1. Choose a language. It may be one you had in high school, or the language your grandparents spoke. Try to pick one you are likely to hear on the ham bands, such as Spanish, French, German and Italian. Choose one you can learn easily. There are many materials available for learning

Spanish, French and Italian, but few for learning Albanian or Flemish. The best choices seem to be Spanish, French, German or Italian.

2. Then learn a little. Get hold of tape recorded QSO's (advertised in ham publications), language records, (Dover Publication, New York) or take a course at any one of many language schools ready and waiting for you.

3. Use what you know. You can always fall back on English. But remember, English is a foreign language for the other fellow. Why should he speak your language and not you his?

4. Don't be a perfectionist. Unless you can live in the country more than three or four years, you will probably never speak the language like a native. So speak as correctly as you know how, but speak to be understood.

5. Ask your contact for help. Few will refuse to coach someone making the effort to learn their language.

In just a few month's time you'll have learned to speak a foreign language, advanced international relations, and added many hours of enjoyment and warmth to your hamming. What language will you learn?

. . .WA1GFJ

Editor's comments:

The most difficult part of speaking a foreign language is getting started. It can be frightening – like learning to walk. You feel insecure and embarrassed.

I suggest that you get started slowly and easily in the first stages. If you start out by learning some of the basic ham contact info in the foreign language, and then get so you can give more and more of that, you will be on your way. After all, if you've worked many Italian stations you may have discovered that a lot of them don't seem to know any English at all, yet are able to give you the regular ham contact routine in English. As long as you stick to the name, town, and signal report you are okay. Take a page from their book for starters.

Eh bien, mon ami? Pardon, s'il vous plait, mais nous desirons parler en Francais pour un moment.

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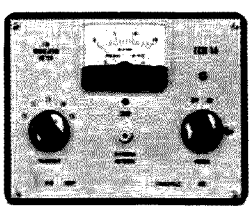

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Figure 1 is the schematic of the unit. At first glance, it appears as any other straight forward amplifier. However, several things were done to increase its overall effectiveness.

Notice the output circuit. Utilization of the commercial choke produces one big benefit. Due to lower Q than would be obtained with an air wound coil, no tuning is necessary. The bandwidth at the half power points will be approximately 10 MHz. In other words, you'll notice very little difference in gain across the entire six meter band. Tuning of the output circuit is accomplished by the 6 pF capacitor. By using 50 pF in series with the 6 pF across the tank coil, the equivalent capacity across the coil tunes the circuit to the six meter band. By taking the output from across the 50 pF, gives an impedance of approximately 50Ω for matching purposes.

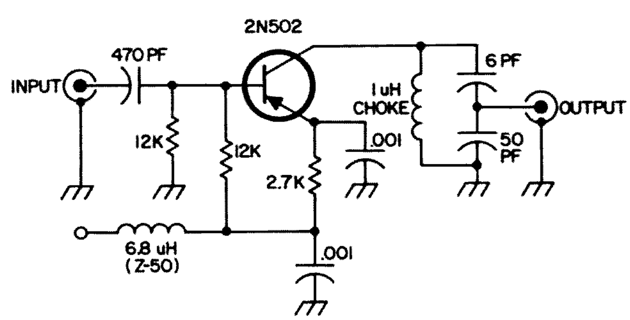

Fig. 1. Schematic diagram for simple six pre-amp.

Don't be fooled by the lack of an input tank. Use of the fairly large coupling capacitor and no tank circuit eliminates the problems of detuning often caused by different lengths of coax.

Where this pre-amp shines is with receivers of tube input (especially those without an rf stage). Typical performance of this little pre-amp with one well known receiver produced the following results. The noise

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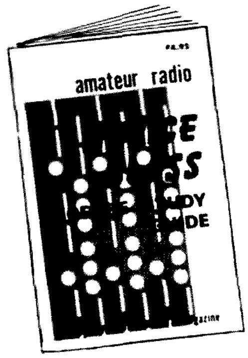

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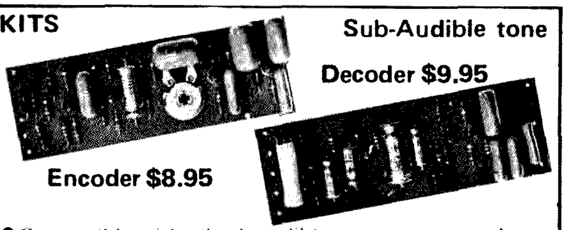

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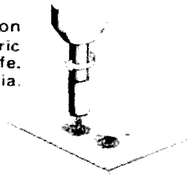

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level increased one S unit, whereas the signal level was increased three S units. The performance is better due to the inherently lower noise figure of transistors compared to tubes.

Do you have a super regenerative receiver on six?This little pre-amp ahead of it can really make a difference in performance as well as cutting down on the radiation common to that type of receiver.

With the 2N502 specified, typical power gains between 15 and 20 dB have been measured. Drain from a 9 volt source runs less than 50 milliwatts.

One word of caution: make sure the input is separated from the output when you build up this little pre-amp. Several were built (not by me) where this was not the case. What you'll end up with is a preamp for six as well as a converter (but, who knows for what band).

The choke in the supply lead may or may not be necessary. In some applications it was necessary to use the choke.

To increase its effectiveness, try raising or lowering the voltage a little. You'll find a point where the best ratio between noise and signal level may be reached.

For the more ambitious builder, we might offer the following suggestion. One version of this pre-amp was built where commercial chokes were switched giving us coverage for 6, 10, 15, and 20 meters. We used a string of live commercial 1 μH chokes. The bandwidth for the lower frequencies will correspondingly decrease. This, of course, helps due to the decreasing frequency spectrum you are interested in.

If you're really daring, build two, and use them in series. Be careful here though, as lead dress, component placement, etc., all become about ten times more important.

So, next time you wish for a just a little more oomph on six, give this extremely simple circuit a try.

Incidentally, 14 turns of number 22 wire, 3/8 inch diameter, air wound can be used for the 1 μH choke at a sacrifice of bandwidth.

. . .K9VXL

Paul Schuett WA6CPP/WA7PEI
Box 10
Wallace CA 95254

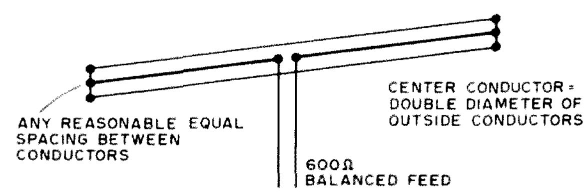
THE THREE-WIRE DIPOLE

After having been on the air a year or so, I ran into an old timer who was running a 3-wire dipole. I was running an ordinary dipole on 40m and a folded dipole on 75m, but had given no thought to a 3-wire dipole. He mentioned that it was a good antenna; I thought it would be an interesting try. So, one spring day, with nothing much better to do, I solicited the aid of the Jr. Op. and we commenced the 3-wire dipole.

First you need some spacers. About this time I ran across someone connected with an advertising sign company, and he gave me some scrap plastic. A moment with a band saw and a drill gave the necessary spacers. A few minutes perusing the antenna handbooks gave me information on impedance stepup vs. wire size and spacing. For simplicity, we used the center wire as double the diameter of the outer two conductors, making the impedance independent of spacing, and giving us a nominal 600Ω feed point.

Using 75Ω coax into a 4:1 balun gives us only 300Ω, so a ¼λ section of about 450Ω line (slopped together in a hurry using approximate measurements) acted as an impedance transformer.

This antenna was constructed for 20m so that the matching section wouldn't have to be too long and because we had about that much physical room available between the supports. Only one afternoon's work, and up it went! This antenna stayed in service about a year and gave excellent results. At times, depending on conditions, it was possible to make contacts impossible to hear on the beam. The nicest feature was the extremely good bandwidth – it was possible to cover the entire 20m phone band without the SWR going over 1.5:1. No adjustment of tuning or loading was necessary once the rig was tuned near the center of the band.



Changes always get made, and this antenna is now rolled up and somewhere in the corner of the garage. The results were most gratifying, and I am now building another system using two of these in a phased array.

The advantages of the 3-wire dipole over the ordinary dipole are added bandwidth without impedance change, better performance in not having to compensate tuning or bading when QSYing, and apparently some improvement in signal strength. It was suggested that since there is more wire in the air, there is more capture of received signals and correspondingly greater strength in the receiver. The same would appear to be true on transmit.

The disadvantages are the higher feed point impedance, making it necessary to do some sort of matching, the added weight with more wire and spacers, and somewhat greater wind resistance.

The advantages and performance outweighed the disadvantages in this installation – in addition to many stateside contacts, it was possible to work Alaska like they were down the street, Siberia, Europe and Latin America.

When you want to spend an afternoon on a project, remember the 3-wire dipole.

. . . WA6CPP/WA7PEI

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England

LOADING UP FOR OPTIMUM ANODE CURRENT OR RF OUTPUT

Before and shortly after World War II, most rigs were home brew and operated CW or AM. These rigs usually consisted of a series of separate pieces of appartus: a transmitter, a receiver, an antenna change over relay, a control panel, a send/receive switch, and usually an antenna ammeter.

In those days one often looked at the antenna ammeter when loading up. It was, of course, clear that the antenna ammeter was only a comparative indication, and that if any change was made between the antenna ammeter and the antenna itself, such as the installation of an antenna tuning unit, this would materially change the reading on the antenna ammeter.

So, many of us gradually lost interest in the antenna ammeter, and in many installations it disappeared completely.

Tuning up was then done by observing the final anode current meter. The rig was loaded up to a specific anode current. This was true when many of us had our antennas link-coupled to the tank circuit.

The anode current meter continued to be the most important indication in loading up the final when we went over to pi-output circuits and for some time the anode milliammeter was the only means of loading up the final in commercially built rigs.

Some people used field strength meters to check their loading. Then came some wattmeters which could be left in circuit during operation. Also several manufacturers such as Drake and Swan included comparative rf output meters.

Comparing the loading by the reference to the rf output meter with loading by the anode current meter, shows clearly that these two methods are not always the same. If all rigs "looked into" an entirely non reactive load of 50Ω the difference might not exist. But in practice, especially with mobile antennas, it is rarely possible to make the antenna show a non reactive load of 50Ω at all frequencies in the amateur bands.

Many amateurs still tune up for optimum loading (within the prescribed limits, of course) of the anode milliammeter.

Tests which I have made with several different types of transmitters and transceivers, including KW Victory, Drake TR3 and TR4, all show that loading up by reference to the rf output gives far better results. Often a noticeably lower anode current can produce a greater rf output indication and reports from the distant stations indicate that this is the better signal and not the signal obtained by the best loading according to the anode current meter.

. . . G3BID

Earle H. Eaton
851 Springfield Ave. 8D
Summit NJ 07901

A Digital Interlaced Sync Generator for Closed Circuit TV

Unlike the usual interlaced sync generators which employ multivibrator, blocking oscillator, or unijunction stairstep divider circuits, this digital design provides stable operation at low cost, and with few components. Only the master oscillator frequency and output pulse periods need be adjusted. The total cost should not exceed $20

Circuit Operation

Integrated circuit IC-1 is an astable multivibrator which operates as a 3.5 kHz master oscillator. IC-2 through IC-4 are modulo-N dividers which divide the master oscillator frequency by 525, producing 60 Hz vertical sync pulses. IC-6A permits adjustment of the vertical sync pulse period.

IC-5 is a modulo-N divider which halves the master oscillator frequency producing 15.75 kHz horizontal sync pulses. IC-6B permits adjustment of the horizontal sync pulse period. Note that both positive and negative pulses are available at the outputs of IC-6.

Adjustments

Before applying power to the circuit, adjust resistors R1, R3, and R4 for their approximate mid-position setting. Apply power and check pin 6 of IC-1 with a scope. Adjust R1 for a square wave with a total period of 32 microseconds. (Since R2 is a fixed resistor, the positive and negative excursions of the square wave may be slightly asymmetrical.)

Connect a scope to pin 6 of IC-6A and adjust R3 for the desired pulse period (1300 microseconds standard).

Finally, connect the scope to pin 10 of IC-6B, and adjust R4 for the desired pulse period (7 microseconds standard). This completes the generator adjustments. Any slight drift of the master oscillator will have little effect on the interlace.

...Eaton

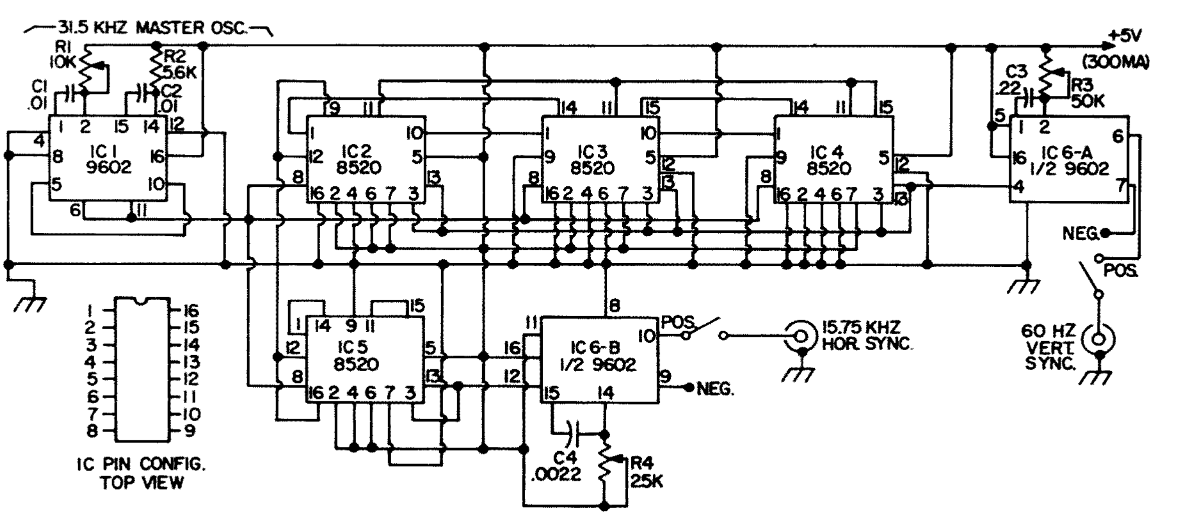

Fig. 1. Schematic of the digital interlaced sync generator. R2 is 5.6K ½W 5%; potentiometers are miniature and capacitors are mylar. IC-1 and 6, 9602PC, are available from Schweber Electronics, Syosset NY, $3.00 each plus postage. IC-2 through 5, DM8520, are available from JTM Associates, P.O. Box 843, Manchester MO 63011, $1.90 each plus postage or from Babylon Electronics, P.O. Box J, Carmichael CA 95608, $2.00 each plus postage.

Walter C. Powis K3SCW/AFA3SCW
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Notes On Converting The AC/DC For WWV

By the addition of a few simple parts, the receiver in the article, "Converting the AC/DC for WWV" by W3JJU, Oct. 1971, *73* can be made selectable from 10 MHz to 15 MHz. All of the coil dimensions remain the same as in the original article and the rf and oscillator sections are retuned by switching tuning capacitors. From the circuit in Fig. 1, it can be seen that some of the parts values have been changed. Capacitor C5 is a small variable with its shaft brought out to the front panel. This is used to compensate for any oscillator drift that may be encountered during warmup. During calibration, this capacitor should be in the center of its rotation. It should be noted that the 15 MHz position has to be calibrated first with C6 to tune the oscillator, and C3 to peak the rf amplifier. Then switch SI to the 10 MHz position and tune C4 and C2 respectively.

Because of the propagation changes during the day, it is an asset to be able to receive more than one WWV transmitting frequency. Since I work the 20 meter band most of the time, I can usually tell how propagation will be by listening to WWV on 15 MHz. With a little more thought, other WWV frequencies can be selected. It is even thought that if the cost could be tolerated, the oscillator section could be crystal controlled.

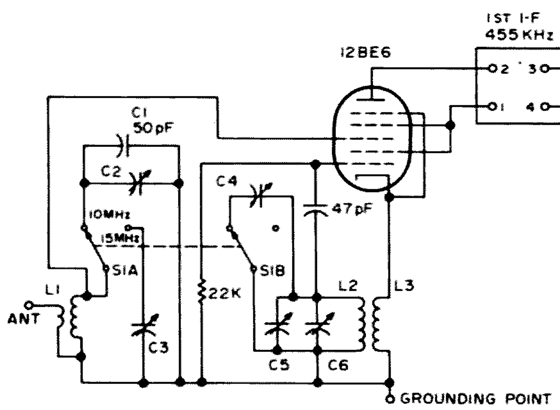

Fig. 1. Schematic diagram.

Parts List

C1 50 pF silver mica capacitor.
C2 1.5–10 pF compression trimmer capacitor, ELMENCO 402
C3, C6 7–60 pF compression trimmer capacitor, ELMENCO 404
C4 7–100 pF compression trimmer capacitor, ELMENCO 423
C5 1.8–8.7 pF miniature variable capacitor, E.F. JOHNSON 167-104-1
S1 DPDT selector switch

. . . K3SCW/AFA3SCW

Bill Welsh W6DDB
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ELECTRIC EXTENSION CORDS

It has been said that "familiarity breeds contempt" and also that "a little knowledge is a dangerous thing." Both seem to combine to cause hams to use extension cords improperly. We're familiar with wire and we know about voltage drops. Unfortunately, we tend to push extension cords past their limits, and this can cause trouble.

This article contains some information which is useful to anyone who uses an extension cord – and that takes in almost everyone! If you are one of the few wise ones who use extension cords properly, you are to be congratulated; even if this is the case, you'll be sure to know others who can benefit from reading this article.

Wire sizes and gauge numbers run opposite to each other. The larger diameter wires have smaller gauge numbers, and vice-versa. This article is primarily concerned with 8 thru 18 gauge wires and Table I lists their diameters in mils. Remember that 1 mil is 1/1000 of an inch.

Wire has a known dc resistance per unit length and this value is normally listed in Ω per one thousand feet. Basically, larger wire has less resistance per foot than smaller wire because the electron flow has a larger cross-sectional area (pipeline) to pass thru. As an example, 8 gauge (0.1285 inch diameter) wire has less than 1/10 as much dc resistance as 18 gauge (0.0403 inch diameter) wire.

Table I. Wire Gauges and Diameters

Gauge Numbers	Diameter (Mils)
8	128.5
10	101.9
12	80.8
14	64.1
16	50.8
18	40.3

If you intend to use an extension cord, you'll have to determine the total current it will have to handle by adding the current requirements of each device you plan to plug into the cord. Amperage (current) requirements are frequently shown on equipment and in associated instructions. If just the power (watts) is shown, divide it by house voltage (115) to determine the amperage requirement. As an example, a 230 watt device draws two amperes from a 115 volt input power line. If you're going to feed a motor which doesn't show amperage or power data, Table II can be used to estimate normal current requirements of motors rated at 1/6 to 1 full horsepower.

Use the shortest extension cord that will comfortably reach between the available power outlet and the electrical device which temporarily needs to be powered at some remote point. Line loss causes the cord to heat up. If the loss is excessive and if it is sustained continuously for a long time, the overheated cord could damage materials it touches and could start a fire. Regardless of how short an extension is required, use one which has large enough wire to handle the total current requirement. If you have to use the same electrical device at a location which is further from the power source (wall socket), it is usually necessary to switch to a cord with larger wires. Table III lists the gauges of wires required in extension cords used to supply 2 – 20 amperes of current 25–100 feet from the power source.

Table II. Amperage Requirements of Motors.

Horsepower Rating	Amperes
1/6	4.4
1/4	5.8
1/3	7.2
1/2	9.8
3/4	13.8
1	16.0

Do not use a 2 – wire extension cord outside or in any damp inside area. Since 1 January 1970, the Underwriters Laboratories have required 3–wire cords for these applications. When using a 3–wire to 2 wire

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Table III. Wire Gauges, Extension Cord Lengths, and Current Requirements.

115V ac extension cord length, in feet.

TOTAL AMPERES	25	50	75	100
20	10	10	8	8
18	12	10	10	8
16	12	12	10	10
14	12	12	12	10
12	14	12	12	12
10	14	14	12	12
8	16	14	14	12
6	16	16	14	14
4	18	16	16	14
2	18	18	16	16

adapter to connect a 3 wire extension cord to a normal 2 wire home power connector, make sure to attach the green grounding lead (on the adapter) under a screw head on the power outlet cover; don t leave it hanging loose!

If you are going to use an extension cord in an area where it could become covered with water, oil, or grease, select a cord which has an outside protective insulation which is resistant to these substances.

Most of the cheap extension cords carried in markets can't safely handle more than six amperes. If a blue UL tag is attached, it will list the amperage, voltage, and wattage ratings of the extension cord. The connectors, of course, usually are rated above the capability of the cords they are attached to, so one can't assume that the connector ratings apply to the entire extension cord.

It is important to remember that extension cords are just a temporary means of supplying electrical power to equipment. Don't tape or staple an extension cord in place, because that would be using it as semi-permanent wiring. If you find yourself about to do this type of thing, please reconsider and have permanent wiring added instead. Brightly colored extension cords (yellow, red, etc.) serve to remind one that a temporary extension cord is being used. The white and brown cords blend in too well to be noticed.

Put your knowledge to work to minimize risks associated with extension cords. Carefully select the proper cord to serve as temporary wiring in each application. Pass the word along to your relatives and friends. Extension cords don't cause troubles, but their incorrect uses do.

. . .W6DDB

Hugh Aitken WA1FBE
85 Dana Street
Amherst MA

Longer Tube Life With The NCX-5

Would you like to get more power out of your National NCX-5 transceiver? It's not difficult, now that 6LQ6/6JE6 TV sweep tubes are available for use in the final amplifier. Write to the National Radio Company in Melrose, Massachusetts, and they'll send you a bulletin specifying the minor circuit changes necessary. You have to change the bias resistor (R-36) to about 68K, substitute larger plate caps, and modify the power supply so as to give between 950 and 1000 volts on the high voltage side under load and 300 volts on the lower voltage side. Screen voltage should be no more than 200V. Tune for 400 mA at resonance and you should be able to get between 400 and 500W PEP input or about 275W output. Better keep a fan or blower on the 6JE6's, though, while you're getting everything set up, or you may lose your first pair of tubes.

The National company doesn't recommend this modification, but it's a simple one to make. The question is, is it worth while? Is the extra power worth the trouble? Doubling power is only a 3 dB gain, or one-half an S-unit. If you're already running 200W input, the only place to go is to a "full gallon" if you really want to make a difference. Or maybe your time and money would be better spent improving your antenna.

When I put 6JE6A's in the final of my NCX-5, my purpose was not higher power but longer tube life. My rig first emerged from its carton with 6JB6's in the final. I operate CW almost exclusively, and that 50 to 75% duty cycle was rough going for a rig designed primarily for single sideband. Frequent tube replacement was costly and a nuisance – doubly so because of the necessity for securing a balanced pair. Reduced loading of the final was definitely not the answer to this problem; underloading meant excessive screen current and shorter, not longer, life.

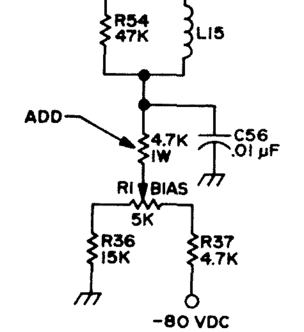

Fig. 1.

Availability of 6JE6's offered a way out of this difficulty, but not until after an educationsal QSO with Steve Lawrence WB6RSE, then a senior at U.C.L.A., and some subsequent correspondence did I get the minor circuit modifications figured out. You have to modify the bias circuit a little,

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2 meter	Single	20 dB	2.5 dB	$15.50	$18.50
2 meter	Double	40 dB	2.5 dB	$30.50	$36.50
220 MHz	Single	17 dB	2.5 dB	$15.50	$18.50
220 MHz	Double	35 dB	2.5 dB	$30.50	$36.50

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but adding a 4.7K resistor between R-1, the bias adjustment potentiometer, and R-54 will take care of that in most cases (Fig. 1). The essential change is in the screen supply. Here you have to provide 150V *regulated* on transmit, instead of the approximately 250V the old 6JB6's used. Add a 3K 10W resistor to the screen supply and regulate it with a 1N1812A zener, and you've got it (Fig. 2).

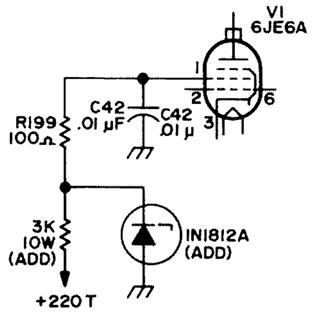

Fig. 2.

The zener mounts very easily by slightly enlarging one of the ventilating slots around the final tube sockets, and can be used as a tiepoint for the rest of the rewiring. Clip the 220T side of R-199, connect it to the zener, and add the 3K resistor between the zener and the former 220T tiepoint. This should do it; if your idling current is still too high, adjust the values of R-36 and R-37 until you get the proper reading (50 to 60 mA).

You will probably have to retune some of the driver coils (L-1 through L-5). Carefully peak the "exciter tune" control first on each band, and then tune the appropriate driver coil slug with a plastic alignment tool through the holes in the enclosure. Adjustment of L-6 through L-10 is not necessary.

Of course you can always, if you like, use 6JE6C's, and step up your plate voltage and current to get between 400 and 500W input to the final, but what's the point? Leave your power supply unmodified, make the minor changes in bias and screen supplies outlined above, and with 6JE6A's in the final you can forget about short tube life – and about matched tubes as well. These bottles will take a tremendous amount of abuse, and they seem to last forever. If you operate CW, own an NCX-5, and like tubes that won't quit, give this simple modification a try.

. . .WA1FBE

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Apartment Dweller's ANTENNA SYSTEM

The basic requirements for an apartment dweller's antenna system are 1) the antenna shall put out a good signal, i.e. if a station can be heard he can usually be worked, and 2) the antenna shall be as inconspicuous as possible so that neighbors and your landlord do not object, particularly where the apartment lease forbids antenna installations.

System Testing

The antenna is tested during a period of high activity on the various bands – during a contest. The contest period is chosen so that reports from a large number of stations can be obtained in a relatively short period of time. Note that the failure of a station to respond to a call is a valid "negative" report.

The invisibility of the antenna is tested by usage. It is only visible during actual operating periods. If at those times it is inconspicuous, then no complaints will result. If after a month or so no complaints have been received, the test is successful.

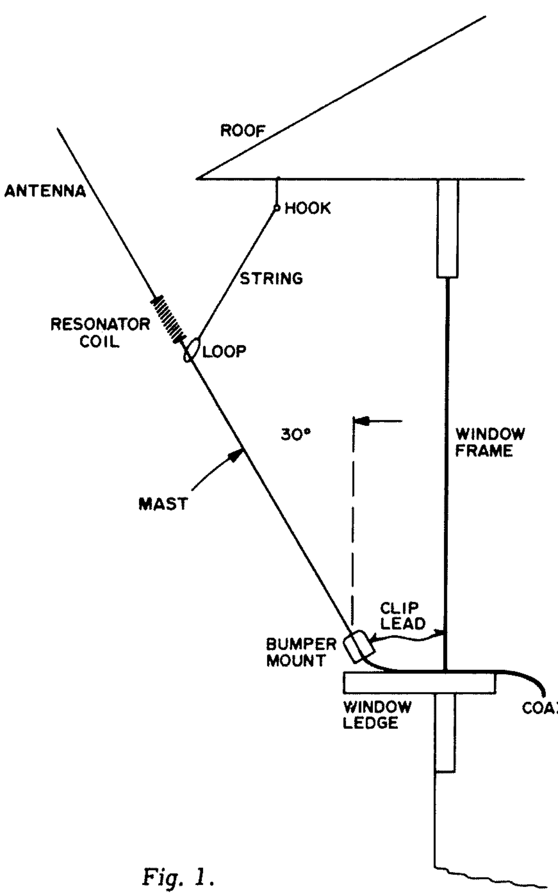


Fig. 1.

System Description

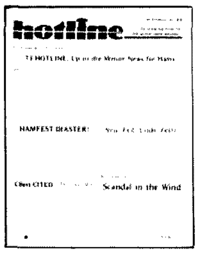
The antenna used is a Hustler mobile whip, operated out of an apartment window at about 25 ft above ground as shown in the sketch. This antenna system was chosen in preference to others because it was easily collapsible and did not fall down under the weight of ice or due to the effects of winds or large trucks, as did earlier long thin-wire arrays.

Setting Up

Attach a hook or other fastening element to the wall or roof outside the building above the window. If a convenient tie point is available, it may of course be used. A piece of string is tied to the hook and a loop about 3 in. in diameter is tied in the other end of the string. The mast is screwed onto the bumper mount and laid to one side. The resonator element is passed through the loop, then screwed to the mast. The antenna is then pushed out of the window and the bumper mount placed on the windowsill.The mast is supported by the string. The window is then closed, wedging the antenna in place.

The first time the antenna is used, the length of the whip is adjusted for minimum

HOT NEWS! for hams...



The 73 HOTLINE is published every other Friday. This newsletter will cover all the up-to-the-minute happenings in amateur radio... FCC news...new petitions filed...new actions...DXpeditions... new products...propagation flashes...Hotline Classified ads...job opportunities in the ham field...hamfest and convention news... contest news...all those things hams want right now, not two months later as is the case with a magazine. The 73 HOTLINE will be chock full of last minute news since it will be in the mail just a few hours after the deadline closes.

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swr in the same way as is done in a mobile installation.

Dismantling the antenna just requires opening the window and pulling it in. The string may be left hanging or tied down to the window frame by catching it between the window and frame when the window is closed. The whole operation of erecting and dismantling the antenna takes only a matter of seconds.

Using the Antenna

In order to keep the antenna inconspicuous, the 75 and 40 meter resonators are used only during the hours of darkness when the whole antenna cannot be seen. By day, the small size of the 15, 20 and 10 meter resonators keeps the antenna inconspicuous.

In use it is possible to alter the effective angle of radiation of the system by varying the length of the string so as to change the angle of the antenna with respect to the vertical position.

Results

Any antenna system is judged by its performance. This one was tested during two contest periods driven by a Yaesu FT 101 barefoot with the following results:

(1) CQ WW DX Contest, October 1971, worked Europe, Africa, North, South and Central America. Did not hear Asia or Oceana. CR6, XX6, 8P6, 9Y4, EA, ZF and CT were worked on 20m alone.

(2) ARRL Sweepstakes, November 1971, worked 63 Sections, 45 States including California on 40m, and all Canadian Sections including VE8.

During both of the above contests several pileups were heard and with careful timing a contact was made in most cases.

No comments or complaints as to the antenna have been received up to the present time.

Conclusions

The apartment dweller's antenna system puts out a good signal on all bands. While it will not replace or outperform a beam or a quad, it does allow transmitting operation under many unfavorable (to the amateur) conditions.

...G3ZCZ/W8

Ms XYL E. A. Gray
8955 East 83rd Street
Raytown MO 64138

MY HAM'S OLD SHACK AND OTHER ABOMINATIONS

What's a nice girl like me doing in a place like this? All this squealing and dah dits and WAØ's and interference and skip is enough to drive a strong woman up the wall and upside down across the ceiling. That's what happens when an unliberated female enters holy wedlock with an (in deep) ham operator . Of course you get used to it as you learn patience, fortitude and create a sense of humor out of hysteria.

I've learned patience so well I can sit calmly – my fingernails actually growing through my clenched fists – with my face deceitfully expressing a serene concern and interest in whether we should go FM, get involved with the repeater, go mobile, buy a crankover or ground plane, etc.

My fortitude has given birth to a kind of patience of Job, as one by one the absolutely-had-to-have transceivers, converters, monitors and rectifiers have decayed into a state of abject obsoleteness. Funny how old furniture and clothes never reach that stage, isn't it? "Lots of wear in it yet," my operator always says.

My sense of humor actually came from the need to laugh or, for crying out loud, go with the boys in the white coats. When a friend comes to dinner, a guess-what-kind-of operator of course, and I ask, "Have you heard that new rock group, the 'Whatchamacallits'?" and he replies, "Yeah, they got great rhythm," then turns to his host and says, "If we could get a bigger transformer and raise the beam another ten feet and convert the . . . " I *need* a sense of humor.

When I ask sweetly, "Did you see the home team beat the tar out of those smart-aleck West Coast bigots?" and he answers, "Man, that new quarterback is sumpin' else," and adds, eyes on fire with excitement, "I think I've got a chance to trade for a new so many meters with a vertical something or other and a matching thingamajig," that's my cue to exit to a quiet place or visit with my English-speaking neighbors.

At night I go to bed by myself or watch ziggagging or growling TV while my operator calls nets, has roundtables, turns rotors, cranks beams or has eye-balls.

From a cute little boy who fastened two tin cans together with a string and yelled into one, "CQ, CQ, CQ," and listened to the imaginary answer, he has lived his life by wire and put me at a tension that is getting ready for a mighty recoil.

Out riding in the beautiful countryside, I cry "Oh, look at that gorgeous . . . " and he hisses, "Be *quiet*, that's old WAØBVD, or is it CWE, who helped me with my first two meter kit. Break, break!" Speaking of "break," I sometimes have an overwhelming desire to break – well, almost anything.

A friend asked, "Why don't you leave him?" Well, I've given it some thought, but I'm an unfortunate orphan with no place to go and too big for adoption and besides I love the ham, who occasionally tunes into my wavelength and generates a little "Switchcraft."

. . .XYL Gray

Bernard Ostrofsky W9HTF
670 N. Tippecanoe St.
Gary IN 46403

AUTOMATIC VERTICAL TRIGGER FOR SSTV

In order to improve the vertical sweep function of a slow scan TV receiver converter[1] the circuit shown in Fig. 1 was constructed. The vertical retrigger consists of Q1, Q2, and Q3. If output is taken from Q3 it would be necessary to reverse connections to the vertical plates of the cathode ray tube due to phase inversion. In order to eliminate the problem so that the oscilloscope used with the SSTV converter could be used without reconversion for normal response the operational amplifier stage was added.

The wave forms shown in Fig. 2 indicate the output from the original vertical sweep circuit (non-recurring) output from Q2 and from the op-amp. The negative bias applied to the inverting input of the op-amp restores the polarity and makes the wave form congruent with the original. The 5000Ω potentiometer is set for a sweep period of 8.5 seconds.

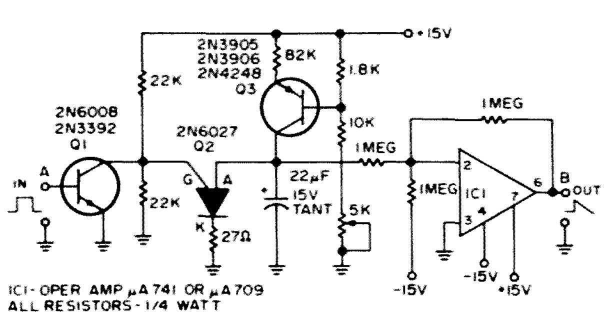


Fig. 1. Automatic vertical trigger circuit.

The original circuitry to be replaced is shown in the broken line box in Fig. 3 along with the points for connecting the input and output.

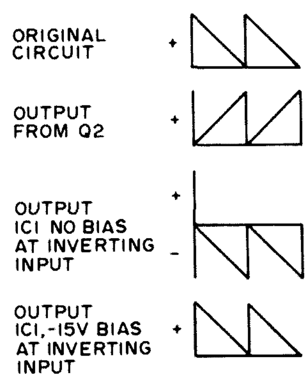


Fig. 2. Vertical output wave forms.

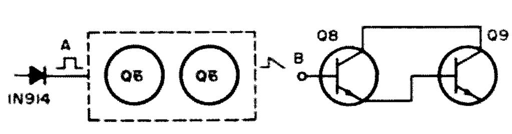


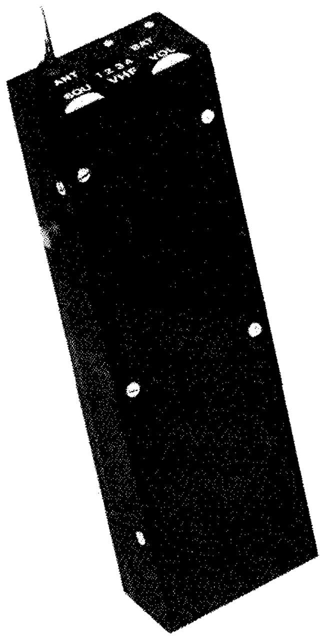
Fig. 3. Circuit replacement points.

The entire unit was built on a 1 x 2.5 in. piece of perforated Vectorboard and mounted directly above the original components.

...W9HTF

1. Briles, Bill and Gervenack, Robert, "Slow-Scan TV Viewing Adaptor for Oscilloscopes" *QST*, June 1970, pp 46–50.

George R. Allen W1HCI
80 Farmstead Lane
Windsor CT 06095



The New HT-144B Hand Held

2m FM has produced some drastic changes in amateur radio. No longer is the radio amateur limited to communication from his home station or from his car. By using small hand held units on 2m, the amateur can carry on communications from areas which were inaccessable in the past from a communications standpoint. Communication via hand held units is not only useful from a "rag chew" standpoint, but is extremely valuable in times of emergency or disaster. Because of the heavy participation of hams in times of emergency it has become the goal of most amateurs who operate 2m to own some type of hand held equipment. Unfortunately, most of the equipment in this category is somewhat costly being in the $200 and up range and the majority of the HTs are made outside the country. In addition most of the hand held units cannot be maintained by the average ham. In cases where a problem develops, the unit must go back to the factory. Since the units are foreign made, it is difficult to obtain spare parts or vital subassemblies. For these reasons, a large number of 2m operators have put off the purchase of that desirable "HT."

VHF Engineering in Binghamton NY has introduced a low cost hand held kit for 2m which almost every 2m amateur should be able to afford. This kit provides a simple, inexpensive answer to 2m FM operation. The unit is designated the "HT-144B" and is described in detail in this article.

Specifications

The HT-144B is manufactured by VHF Engineering in Binghamton NY and is available in kit form through the manufacturer or through dealers across the nation. The kit is very complete and includes all parts except the nicad batteries and the charger. These items are available as accessories. One set of crystals is included, your choice of 94-94, 52-52, or 34-94.

The transmitter puts out a minimum of 2W on one of four crystal controlled channels at 2m. Modulation is accomplished by using a speaker/mike into an amplifier driving a varactor modulator. Netting

trimmers are provided for all four channels.

The receiver is rated at .35μV for 20dB quieting and puts out .5W of audio, .25 squelch/sensitivity. A pair of crystal filters provides adjacent channel rejection of 60dB.

While four channels may not seem to be enough, most HT owners that I talk to say that four channels are sufficient. But no matter how many channels you have, you wish you had more. By limiting the number of channels to four, the manufacturer has kept the cost of the unit to less than $130. This is a remarkable buy in these times of inflation.

Construction

The HT-144B consists of a main PC board on which all components are mounted and a tiny PC board for the crystals and the crystal switch. The main PC board is made of epoxy glass and has the parts layout silk screened on the top. By using a silk screened board, the manufacturer has simplified parts placement and the overall construction of the unit. Parts layout is good and not crowded.

The case is made of black, wrinkle-finish aluminum and is very rugged. The case is large enough for the boards and the batteries and has a considerable amount of room left over to house PL tone encoders and the like. The outside of the case is smooth and has enough area to hold a small touch tone pad. There is a jack on the top for use with the optional battery charger. The HT-144B comes with a telescoping antenna. However, an external antenna or a stubby flexible antenna may be used by mounting a BNC connector in the 95mm (3/8") hole provided.

The HT-144B is very easy to build and can be constructed by anyone who has had minimal experience building kits or ham equipment. This kit, however, is not for the arm chair amateur as it requires some knowledge of schematic diagrams and the ability to solder with a low wattage soldering iron. The only tools needed are a soldering iron (26W preferably), solder, screw drivers, pliers and wire cutters. Construction time for the average ham should run about 7 to 12 hours. The instruction manual is clear and concise.

Theory of Operation

The transmitter consists of 7 transistors in a unique design. A speaker/mike drives a 4 transistor cascaded amplifier which in turn modulates a crystal oscillator with a varactor diode giving true FM. The oscillator uses 18MHz crystals and quadruples to 72MHz. The second stage doubles to 144MHz and drives the 2N5389 to 2W output. Both the oscillator and driver use the readily available, inexpensive 2N3866. The output stage is somewhat under rated and because of this does not need a heat sink. All stages are optimized to conserve battery current.

The receiver uses a MOSFET front end, 3N204, and has more than enough gain for the first mixer, a 2N5222. The first mixer feeds a pair of high quality 2-pole crystal filters at 10.7MHz. The second mixer is a 4 transistor cascaded limiter/i-f stage feeding a ceramic discriminator at 455MHz. The audio output IC is a readily available MFC6070. The squelch circuit consists of a noise amplifier which amplifies high frequency noise. The presence of noise causes a MPS5172 switch to cut off the MFC6070. The absence of noise, such as when a signal is present, causes the MFC6070 to be turned on. Squelch operation is smooth and reliable with this circuit.

Switching is accomplished with a double-pole double-throw switch mounted on the side of the main PC board. Both antenna and battery voltages are controlled by this switch.

Performance

I built my unit without benefit of an instruction manual since I managed to scrounge a pre-release unit so I could write this article. The only problems that I had were one bad solder joint and one misplaced component. These problems were found quickly with the help of a 10MHz scope once the batteries were connected to the unit. In practice, a scope or other sophisticated tool should not be needed if a little care is taken with component placement and soldering. The PC board has the placement of all components marked clearly, so it is next to impossible to make a mistake unless you rush as I did.

Tune up is very simple. The instructions call for the use of a signal generator to tune up the receiver. I don't think that the signal generator is really necessary, since I found that even in the untuned condition I could copy signals several miles away. So, I tuned my receiver up on the air.

Tuning up the transmitter is also very simple. Merely connect a wattmeter or a light bulb (#47 bulb) to the output connection and tune for maximum output. A voltmeter is useful to help tune some of the coils, but may not be necessary in all cases.

My HT-144B measured 2.2W out on a Bird termiline wattmeter. The meter measured .3μV for 20dB quieting and the squelch opens at .2μV. I have used this rig in the Hartford area for several months now with excellent success. I have owned other HTs in the past and I feel that this unit will equal anything on the market today. The unit meets all advertised specs as far as I can determine. The only complaint that I have is that the transmit audio is slightly bassey, but not to an objectionable degree. This is typical of HTs using a speaker/mike.

Up to 6 kc deviation has been provided showing quite an improvement over the earlier HT-144.

Conclusions

After having built and operated my VHF Engineering HT-144B, I am very pleased and feel that it is a best buy in HTs at this time. You can't even come close for less than $199.00. I do offer a few cautions however. Schematic reading ability is not an absolute requirement for building this kit. However, the ability to properly solder is. You must be able to solder without dropping globs of solder all over the board and without applying too much heat to the components on the board.

After building this HT kit you will have an inexpensive, well performing unit that you can repair yourself. I recommend it highly. ...W1HCI

CRYPTOGRAM

ZSEDSF USZZQVS CDKU MJYXOG SXJFKD: ZBQLS HL KD SOZS! FSOO FBS XQUYSX CEE ABQF GKH FBJYM DS LDKLKZSX DSVZ.

Joseph A. Kramer WA9DJR
14 East Jackson Blvd.
Chicago IL 60604

TVI FIXIT

Recently I purchased one of those "gizzards in a box" transistorized TV sets for the XYL and paid enough to get that commercial linear. When I stayed on CW I was in the clear but when AM or SSB, that TV tuned as broad as a barn and a high pass filter didn't help. I knew my rig was clean and two black and white sets had no interference. What to do?

I made up a three wire short line cord. Four feet long, to be exact, and covered it with the braid from a piece of coax. The plug I used had a two screw metal clamp and the braid was placed just under the metal ring. Green wire to green plug terminal, white to white, etc. At the other end I attached one of those noise filters that are quite plentiful in surplus, white and black to the input and the braid soldered to the case. I cut the TV cord short (about 9 inches) and soldered it to the output terminals of the filter. The interference filter was attached to one of the back screws that hold the back firm at chassis. Another wire grounded the power supply and the set chassis. While I was at it I put a small fan underneath the cabinet to carry off some of the heat, since I was surprised how hot the wood cabinet was when operating.

No TVI, and what a beautiful picture improvement. Fantastically true colors, a new revelation in color TV. Not to mention a happy XYL, and the OM can operate again!

...WA9DJR

Gerd Treuhaft

FIRST HAM BEEFEATER

O.P.S. Yeoman Warder Reed on the battlements with the antenna stretching 108 feet.

Beefeater Roy Reed is really quite a ham and in fact the real Tower Hamlet. He is better known as Yeoman Warder Reed on duty and G3 LEX off duty to his many friends on the amateur bands all over the world.

When Roy became a Yeoman Warder in June this year, he moved into the Tower with his wife and daughter, becoming the first Radio Amateur at the Tower of London. He has, with the Tower of London's co-operation, been able to erect a 108 foot long antenna behind the battlements in the N.E. side of the Tower.

"It's quite funny on occasions," says Roy. "I call on the wavebands and when I establish contact and tell the receiver where I am calling from he either doesn't believe me or thinks I'm mad and closes down. There was one instance when we made a link between 4 hams all named Roy, so I was immediately named Raven Roy for identification!"

GRR GRRREEN

PHILADELPHIA ATTROCITY

A letter from W3ZWR/2 tells of a most frustrating situation. I gather from his letter that his mother-in-law was somehow involved in notifying the police that Gene's car was an abandoned car. The police came to tow it away, despite efforts of his wife to stop them. Gene is crippled, so there wasn't much he could do. The police never even tried to verify the complaint about the abandoned car.

The car contained reference books, hundreds of tubes, some television sets, some FM equipment, both base and mobile rigs, plus a good deal of surplus gear — all of which was apparently stripped after the car was seized by the police. It also appears that Gene is just plain out of luck on collecting anything from the city for the outrage. It would seem that it is about time for Gene to consult the Legal Aid Society and find out what his rights really are.

THINGS LOOKING UP

The barrage of newly proposed changes in FCC regs seems to indicate that there are indeed better days ahead for us in amateur radio. The restrictiveness which was stifling us just a few months ago has given away to a policy of allowing amateur radio to grow. Since this change in basic attitude has taken place under Chairman Wiley, it may be that we all owe him a debt of gratitude.

The virtual elimination of the logging requirements, the purpose of which had been lost somewhere in history, is a good sample. I talked with the Amateur Division about this a couple years ago and asked why we needed to keep logs in such detail. The answer seemed to be, "Because that s the way it's always been." I wrote and editorial on the subject.

Most of the seriously restricting repeater rules have now been amended or are about to be amended, as promised us by Chairman Wiley back in January when we held the hearing before the Commissioners. This has turned things around for the FM boys and repeaters are going in at a faster clip than ever before. FM was, even then, the largest single interest in amateur radio, with about 40% of the active amateurs participating — now this is heading higher and the day may come when almost every active amateur has a VHF transceiver in his car and an HT on his hip at hamfests.

The repeater growth here in New Hampshire is rather typical, I think. It wasn't very many years ago that there was a 34/94 repeater in Concord (the state capitol) and that was it. A couple years ago we had five repeaters. Today we have nine on the air and three more due on any day. When you consider that there are only about 1550 licensed amateurs in New Hampshire all told, a fair percentage of them must be active on FM to keep twelve repeaters in action.

Unless Dean Birch ends up with more power than it appears he will with the collapse of the Nixon administration, it is possible that amateurs will retain the 220 MHz band. Should this come about, it now seems likely that my proposal for a code-free beginners ticket will materialize which will permit operation in that band. The ARRL is very much in favor of this move (which goes to prove something, probably) and has their directors out talking it up at clubs.

Oddly enough, I view the code-free license with less than total confidence. There is no question that we need more amateurs and need them desperately — and there is little question that the opening of a code-free band would become popular. My reticence has to do with the results of my recently devised code tapes. The fact is that teaching methods have come a long, long way in the last generation and with the newest of techniques it is so incredibly simple to learn the code that a ten year old can do it in about one hour — and that's complete with 26 letters, ten numbers and punctuation!

My five word-per-minute beginning one hour tape cassette has been bringing in letters from all around the world saying how easy it is to learn the code now that there is a tape like this. Kids of eight and nine have been mastering the code with one playing of the 60-minute tape! This leads me to wonder just what all the fuss is about learning the code a 5-per. It now appears that the major difficulty with learning the code in the past has been the lack of any really good system for doing it. Just as the 73 license study manuals broke the back of the theory exams, the 73 code tapes have mercifully eliminated the problem of learning the code.

To digress for a moment. There are four tapes available — with the first being for someone who does not know the code at all. In one hour most people are able to recognize all of the characters they will need to pass the exam for Novice or Tech. The next step is our nasty six word per minute "Back Breaker." This one, using the FCC standards of timing for both words and individual characters (as far as I know this is the *only* tape ever made available which adheres to these standards) and thus properly prepares you to face the FCC. The BB-6 tape gives you one hour of unmemorizable code groups for practice and, when you can handle it, you can walk confidently into any FCC office anywhere and know that you will pass their test easily.

The 14-per tape gets you ready for the General and Advanced tests and has that margin built in which permits you to relax when the FCC tapes start grinding. Ditto the 21-per tape.

Yes, I know all of the arguments against code, and some you haven't even thought of yet. And I know all of the arguments for retaining the code as part of the amateur license (and there aren't very many legitimate reasons). My own reaction to the whole situation is to be in favor of maintaining the 5 wpm entrance exam to the hobby and then depend upon the enthusiasm of CW operators to encourage higher speeds.

Since I have recently made up a tape of the Novice theory I am relatively familiar with the requirements along that line — and they are not much more than one gets in high school physics. It thus seems to me that if we settled upon a beginning license which had the requirements of the present Novice ticket, but which permitted phone operation in the 220 MHz band, we might end up with a good workable result. Licensees would have had to study a little and learn the basics of theory and code, which hopefully might separate them from the CB buy-your-license (or why-buy-your-license?) crowd.

There are over 5000 ham clubs around the country and, with a little encouragement from the ARRL, I suspect that a great many of them could be gotten to set up Novice study classes. As Novices they would be able to work phone in the 220 band and CW on the lower bands, thus getting both sides of amateur radio. Well, it's a thought.

73 GROWING, TOO

About the only thing really hurting in amateur radio today is DX, and even that is not in too bad shape. The dearth of sunspots has made it a bit more difficult to work 350 countries, but somehow new ones keep turning up.

Now that the IRS hassle seems to be over and a couple of very productive people have been added to the staff, we're looking forward to a great fall and winter. I have a bit more time to help with the editing and this may

make the magazine a little more fun to read. We're looking hard for people who would like to represent 73 Magazine at hamfests and other ham events to sell subscriptions, books, study guides and tapes. It's a nice way to make some money and get to meet everyone. If your club is going to have any sort of event, be sure to get in touch with us and set up a 73 booth — it *pays.*

WAYNE TAKES PICTURES

Henry W1AUY, motorcycle number 73, stopped by the 73 offices for a visit. Henry can be worked via WR1ABU in Concord NH most any day.

Rag K1IGF, one of the very active repeater owners of New England, particularly on 450 MHz. You'll hear Ray on 6m a lot too, as well as 146.52 via a very effective remote base setup.

Kathy WB8LOZ and Sue WB8OXB snapped at the 73 booth at Dayton. The next time some CBers starts giving you that stuff about the code being just too much for him, pull out this picture and ask him to explain how come these two nice little girls can cut the mustard when he can't.

Here is W1EFF of the Northern Berkshire Amateur Repeater Club — picture taken at one of the 73 Magazine FM Symposiums.

John K1HZN.

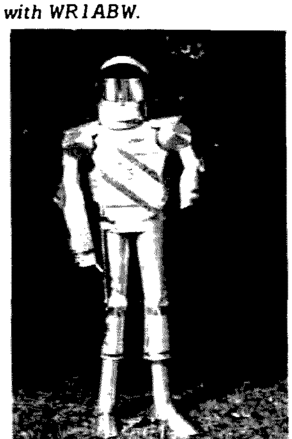
Lew McCoy W1ICP, secret 73 double agent operating out of ARRL HQ.

Ed Clegg W2LOY, designer and father of all those nice Clegg rigs down through the years. Ed has been one of the most enthusiastic supporters of ham use of the 220 MHz band and has put the Clegg company on the line with 220 transceivers and a 220 repeater.

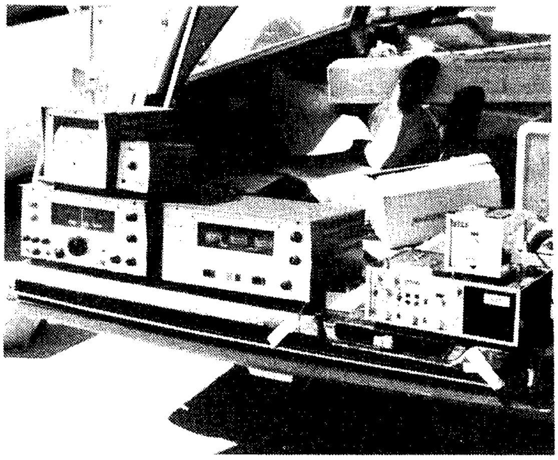
WA1EQN, Nick, of the WR1ABT, New Haven.

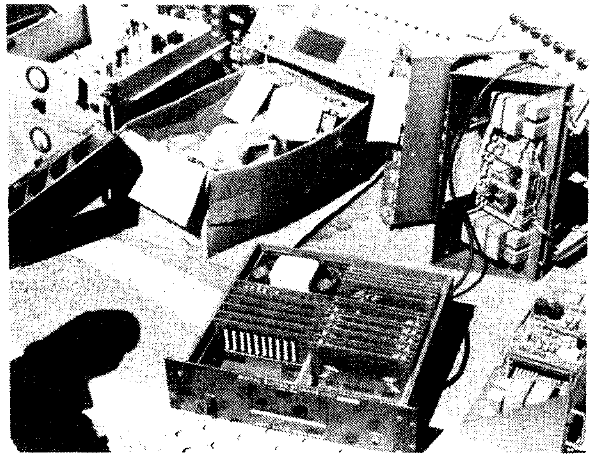
Tony, WA1OND, also of WR1ABT in New Haven.

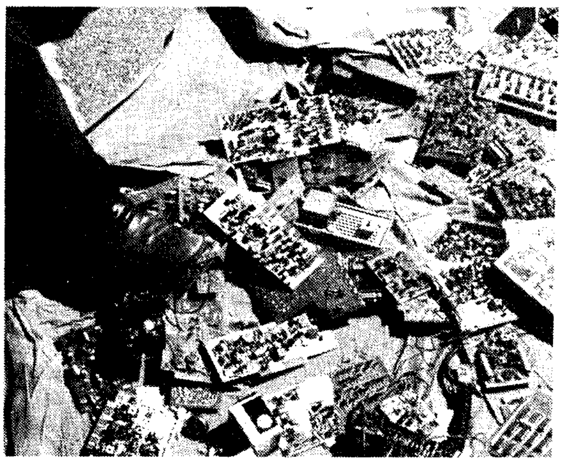
Dick K1ABR, one of the earliest repeater pioneers of Rhode Island. 10-70 continues there with WR1ABW.

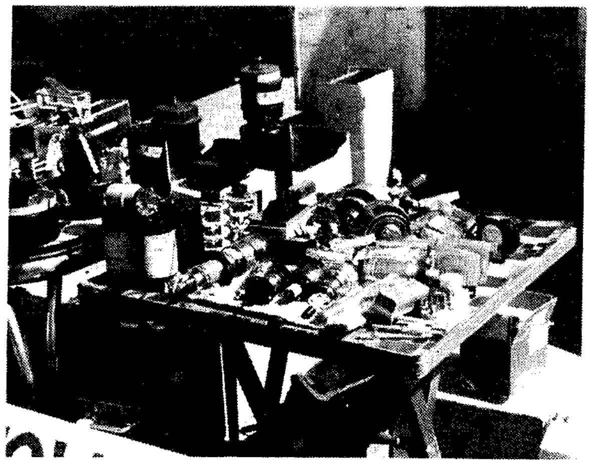


K1REC sent in this shot of a five foot aluminum knight in armor. Lord knows why he built it, but it does have a "73" on it, so huzzah for REC.

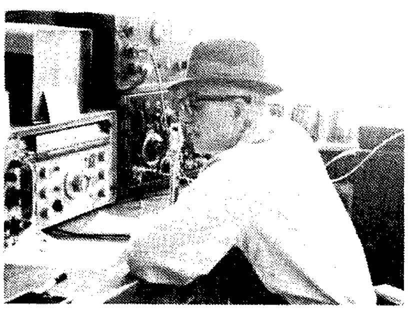








Some snaps taken at Dayton – undoubtedly the world's largest flea market. Some people come bringing truck loads of stuff to sell – some go away taking truck loads of stuff they've bought – all go away happy.



Digging back, here's Johnny Barrows DL4HU at Bitburg in 1962 when I visited him.

Here's Wayne talking to the Bitburg radio amateurs in 1962 – not much change in 12 years other than a little less hair and weight.

I caught this picture of Ed Pillar W2KPQ at a Long Island auction. I've known Ed since before I got my ticket – I used to visit him when I was an SWL!

This one was taken by WA8ZCO on I-75 north of Lima, Ohio! PR for 73 everywhere, if you just keep those eyes peeled.

NEW PRODUCTS

CALCULATOR CLOCK

The Corvus Calculator clock is quite unique in concept. The idea of combining a clock MOS chip with a MOS Calculator Chip appears to be a natural. The calculator provides addition, subtraction, multiplication, square root, division, percentage, reciprocals. The unit displays 10 numerals. The decimal may be set to float or fixed at 2 or 4 places rounded off to the closest digit. The clock chip may be set by a three position switch to display time only, date only, or alternate time displayed for 8 seconds, date displayed for 2 seconds. Clock displays hours, minutes and seconds. The clock will operate as long as the unit is plugged in – the off switch serves only to blank the display. In the event of power failure the readout is all figure 8's.

For more information write *Tucker Electronics, P.O. Box 1050, Garland, Texas 76040.*

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you need help, let 73 know — don't be bashful — the readers are solid gold and are anxious to help you. If you would like to help, let 73 know about that plus your area of expertise, if any, so we can list you for either general help or as a technical advisor.

The following need some help — can *you* spare some time? Clubs in particular take note.

Charles Zabriskie
295 Meadowbrook Road
Weston MA 02193
617-899-3030

Jerry Wilson
3604 Park Avenue
Covington KY 41015
606-431-2320

Basil W Polinchak, Sr.
14 Martha Lane
Lawrence MA 01843
P O. Box 1202
617-685-3910

Robert M. Gallery
5013 Westport Road
Chevy Chase MD 20015

RTTY ART CONTEST
Sept. 1 to Oct. 31, 1974

Entries in the contest should be sent to Don Royer WA6PIR, 16387 Mandalay Drive, Encino CA 91316. Send a five-level tape and five prints of each entry — as many entries as you want — winning entries will be published in 73 Magazine. Write Don with SASE for the full set of rules.

CONTEST CALENDAR

Oct
5-6 California QSO Party
5-7 WE Phone & C.W. QSO Party
12-13 VK/2L/Oceania C.W. Contest
12-13 RSGB 21/28 MHz Phone
16-17 YLRL Anniv. C.W. Party

NOTICE

Watch for an update of the WØLMD SSTV Scan Converter in the November issue.

OOPS!

We left the parts list out of K8VIR's article '3000 V DC Power Supply' which appeared on page 69 of the July 1974 issue. It follows below:

8L = Blower, 60 cfm at .6 inch static pressure. Dayton 4C005 or equivalent.

C1 = Triple-section broadcast capacitor or equivalent. 365 pF per section.

C2 = Jennings 10 to 300 pF Vacuum Capacitor, 6 kV or higher rating.

C3 = 1500 pF air variable capacitor. Spacing dependent on tube plate voltage. Air gap approx. 1 mil/100V of plate voltage. B&W 51241 or equivalent.

D1, D2, D3, D4 = 1.5 amp, 1000V PIV

F3 = (Slow Blow) Dependent on blower chosen. My blower required 2A.

J1, J2 = Chassis-mounting coaxial connectors (SO-239).

L1 = Best, 1/8 inch copper tube silver plated. Alternate, No. 10 or 12 copper wire. Approximate data 6 turns 1¼ inch diameter, 1¾ inches long tapped 1¼, 2, 2½, 4 turns. Note: The exact taps are dependent on coil placement, lead length and driver to linear coax length therefore adjust each tap to cover the entire desired band before soldering.

L2 = B&W 850A. Pi-network inductance.

P1 = Elmenco Fused Plug.

Rx = See Text.

R2 = Five, 5.6 ohm ½W carbon resistors in parallel. Use very short leads. Place .01uFd capacitor directly across resistors.

R5 = Surge resistor. 10 ohm 2W. Note: Check dc resistance of your transformer secondary. If it is 10 ohms or higher disregard R5.

RFC1 = (B&W FC 30A) or equivalent.

RFC2 = B&W 800. Note: see text for modification.

RFC3 = RF choke, Ohmite Z-50.

Lf1, Lf2 = Line filter choke, No. 16 copper wire insulated. 20 turns, 3/8 inch diameter close wound. (Place filter, Lf1, Lf2 & feedthru .01 capacitors, inside bottom chassis at point A-C enters.)

S1 A-B = CRL 2551, 60 degree index, single section double pole six-position ceramic rotary switch.

S1 C = Switch on back of B&W 850A.

S2 = SPST Toggle switch.

T1 = 110V primary, 110V sec, 100mA.

T2 = 7.5V C.T. 21A, filament transformer.

TY1 = G.E. Thyrector, 6R520SP4B4

Z1 = 2 turns No. 8 copper wire, ½ inch diameter. (Silver plated) Shunted by three 130 ohm, 2-watt carbon resistors in parallel.

SATURDAY POST FEATURES

HAM STORY!

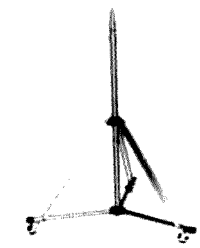
The DXpedition to Gibralter ZB2CS, is the subject of a feature story in the August/September issue of the Post.

For the first time in ages a major general interest magazine is running an article which talks up amateur radio. In this one an American DXer visits Gibralter and tells of his experiences meeting a local ham with whom he has talked for years — and in setting up his ham rig in a hotel and making contacts all around the world.

The article is interesting, too, in its coverage of the interesting aspects of Gibralter. There aren't very many places left where you can stay at one of the better hotels for $5 per day (with a private bath) and eat for under $4 per day.

If you aren't up to buying this copy of the Post to show friends the five page article, at least sneak a substantial look at it the next time you go by a newsstand. One of the benefits to amateur radio if someone could convince the ARRL to hire a PR outfit would be articles like this in many more of the general interest magazines. It wouldn't take very many of these before we had thousands of more amateurs joining our ranks. It takes PR these days to compete with all of the other sports and hobbies — and honestly, do you know of any other hobby that has as much potential for benefit for both the individual and the world as amateur radio?

NEW PRODUCTS



MODEL #TSL TRI-STAND LIGHTPOD

Just introduced is a new and unusual light stand that doubles as a sturdy camera tripod, known as the Tri-Stand Lightpod. When not in use with spots, strobes, or quartz lamps, a camera pan head can be quickly attached converting the entire unit into a rugged camera stand. The camera stand will support most 35mm and 120 size at up to eye level height.

This precision engineered unit made of anodized aluminum will transform from its fully extended height to a portable system in less than a minute. The 3-section column extends from 41 inches to a maximum height of over 9 feet. The famous Safe-Lock clutch collar system locks the column at your desired height. The tripod base is braced with 6 solid aluminum struts which lock into place with the twist of one control knob. Two inch ball bearing caster wheels with toe brakes on each wheel allows optimum mobility with positive anchoring. Gold finished legs and column add glamour to what should prove to be an extremely useful and versatile system. For further information, contact: *Glenn M. Welt, Welt/Safe-Lock, Inc., 2400 West 8th Lane, Hialeah, Florida 33010.*

GUNG HO DXers

Dan Umberger W8ZCQ recently sat down and put the ARRL DX listings in alphabetical order, thereby discovering some interesting facts. The highest country total is a chap with 353 (missing one Daimu, whatever that is). If Wrangle Island is counted (no one has submitted that one), the total possible is 355. Thirty ops have worked all of the currently existing countries, so there is plenty of room left at the top.

Dan counted up the number of ops in each call area that made up the 652 stations listed and found them distributed by call area as follows:

1 – 51	.25%	6 – 116	.29%
2 – 103	.31%	7 – 20	.10%
3 – 38	.19%	8 – 63	.22%
4 – 94	.24%	9 – 63	.24%
5 – 60	.23%	0 – 44	.17%

Since the actual number of "registered" DXers in any call area is not really significant in itself, this number has been divided by the number of licenses issued in each call area to indicate the percentage of DXers in each call area. The W2's came out way ahead on this, oddly enough. The W6's make such a fuss about DX that many ops get the idea that almost everyone in California has a "cool" kilowatt and great big beam – and carries around three hundred plus QSL's in his back pocket. And what happened to seven-land?

. . . *Wayne*

COLLINS ANNOUNCES NEW AMATEUR RADIO OPERATIONS GROUP

Cedar Rapids, Ia., July 9, 1974 – Collins Radio, part of Rockwell International Corporation, is placing increased emphasis on amateur radio activities with the formation of a new amateur radio business operations group.

Appointed manager of the amateur operation is Joe H. Beler W5WY/Ø, who has been with Collins for 14 years in various program management, systems engineering and manufacturing positions. A ham for more than 30 years, Beler holds an extra class license. While serving with the U.S. Air Force, where he attained the rank of Colonel, he was responsible for introducing operational HF SSB to the Strategic Air Command.

Jerry Carter WAØZRW, who has been involved in Collins amateur marketing activities for the past two years, will be marketing manager in the new operation. He has been an active ham for 11 years.

Also joining the new business operation is Arnold Verdow WØLIJ, who will be in charge of product support. A long time Collins employee, Verdow has been active for many years in amateur radio, both with his own station and in activities such as civil defense.

The amateur radio business operation is a part of Collins' Telecommunication Equipment Division based at Cedar Rapids, Iowa.

HEATH 1975 CATALOG OUT

While Heath may be pushing the calendar a little by dating their new catalog 1975, the fact is that it is a whopper and has some interesting new Heathkits featured. This one runs to 80 pages and covers everything they make, including the ham gear, the hi-fi, test equipment, right on up to their $1000 color television set kit!

Some of the new gadgets include a space-age design digital clock/alarm clock, a matching digital clock/day-date unit, a ten watt 2m amplifier for HT's – things like that.

It takes strong willpower to pass up some of the fascinating Heathkits such as the indoor/outdoor digital thermometer, the three band CW transceiver for portable QRP work, and their new high power stereo FM receivers. Heath Company, Dept. 73, Benton Harbor MI 49022.

THINK METRIC!!

The metric system, being inevitable, as must be obvious to everyone by now, it behooves us all to learn and relearn a few things. For instance, re-gear your thinking to the following:

A miss is as good as 1.609 kilometers.

Take it with a decigram of salt.

He was beaten within 2.54 centimeters of his life.

28.350 grams of prevention are worth 453.59237 grams of cure.

Peter Piper picked 8.81 liters of pickled peppers.

And how about a girl who measures .9144, .6604, .9144??

CCRC

Cont'd from p.5

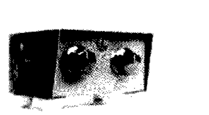
LETTERS

DX STATIONS

As a fellow amateur I thought you might be interested in an incident that happened to me recently. It was a fairly fine day except for the band conditions. About 2100 GMT I heard a 14JJV calling CQ DX on about 14.204. A perfectly clear frequency since everyone was up the band calling the KP6 station. I gave the 14 station a good clear slow call. Upon signing the initial call to him I was told in the rudest way that the frequency was in use. I was sworn at in the worst way. Not one station identified itself. This went on for about three minutes. The language was the kind you might use on a football field as a line backer. Then a W5 very nicely and politely asked me to QSY, that the frequency was in use for some time and he understood that I did not hear the KP6 that supposedly was near by. What people will do to satisfy their ego to work a DX station.

This was not the end of it. Several minutes later I received three obscene phone calls from amateurs in the area. Two of them I did not recognize their voices. But one of them did identify himself. He is a member of the Northern Illinois DX Association. I was sworn at, cussed out, and threatened! His language was worse than what a linebacker would use on the football field. He was one of the guys that cussed me out on 14.204. Most of the other guys were members of the N.I.D.X.A. also. Above all, Gary said that all the DX cards I get at the ARRL 9th region QSL bureau will be TORN UP and then BURNED! He also said that I will never get another card from the bureau again as long as I live. I forgot to say that the ARRL 9th QSL bureau is run by the N.I.D.X.A. and I know that one of the guys cussed me out that day. He was the one that gets all the cards and then distributes them to the letter call managers.

SST T-1 RANDOM WIRE ANTENNA TUNER



All band operation (80-10 meters) with most any random length wire. 200 watt power capability. Ideal for portable or home operation. A must for Field Day. Size: 2 x 4¼ x 2-3/8. Built-in neon tune-up indicator. Guaranteed for 90 days.

COMPACT – EASY TO USE

• • • only $24.94

POSTPAID (ADD SALES TAX IN CALIF.)

SST Electronics, P O Box 1, Lawndale CA 90260

How does the possibility of going to hamfests, or any gathering of hams and making over $100 sound to you? For more information on becoming a local representative for 73 Magazine, write

Director of Marketing
73 MAGAZINE
Peterborough NH 03458

My main concern Wayne, is how the ARRL can entrust a very responsible type of service to such irresponsible people. I know I had quite a lot of cards at the bureau. But what about the 30,000 other amateurs in this region that entrust all their cards to these people? Any one of their cards may be tossed at any time. Especially if they don't like you.

I guess you get the general idea of the story. You can throw this away, publish it or anything really. But I would like to hear your comments if you would please.

Michael A. Krzystyniak (Smith) WB9IJV
412 Lincoln Street
Downers Grove IL 60515

LOG KEEPING

Good evening, Gents. In response to a request from Paul WA5IAT, I called the office of Prose Walker at the Amateur Division of the FCC today. Mr. Walker was on travel, so I talked with one of the other gents there about the new log keeping regulations. Before this phone call, from what I had heard and read, I had the impression that if one placed a calendar in the shack and circled the date of every day he operated, that would suffice for a log under the new regulations. When I related this to the FCC rep, he said that even that interpretation was too strict. I will convey to each of you what I was told today. I can not serve, of course, as the final authority for such, but I can see little chance of misinterpretation of what he told me.

Fixed and Portable Operations:

You are required to log only the date you place the station in operation, and the date you take it out of operation. You should also log the dates of the beginning and end of any long periods of inactivity. In addition, this log should contain the call sign and signature of the licensee "or" a copy of the station license.

Mobile Operation:

There are no log requirements whatsoever for such operation with the exception of "third party" requirements below.

Exceptions:

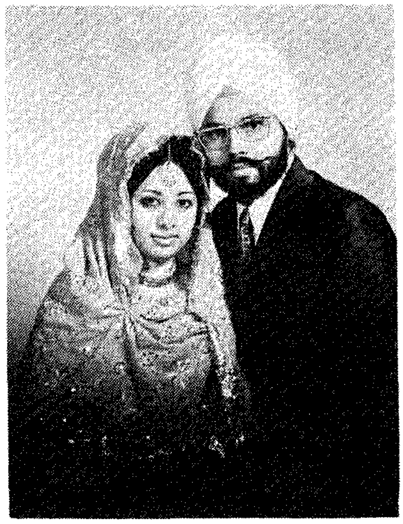
1. You must still log all "third party" traffic. This also applies to mobile operations!

2. You must still have visitors sign the log and enter their call sign. I did not get a complete explanation of this as to the detail of the log in this case. His words were "you must log the date and time periods of visitors with call sign and signature."

3. For remote control set-ups like repeaters where you have more than one controlling station, you must log the date and times the control began and ceased (each operator must log this for his control period).

That's the extent of what I learned today.

de Bob K4EID



RANJIT KAUR
GURBUX SINGH

I hope this letter finds you in the best of health. I am well and wish you the same. I don't know if you remember me, but maybe the following will refresh you. I am the eldest son of Tara Singh XZ2KN of Burma.

When you were in Rangoon, I had asked for a pair of golf shoes and some badminton gut and you had sent it thru Dr. Charan Singh, 9V1NR of Singapore. At that time, I was trying to get a visa as an immigrant to USA. The official Red Tape was stalling and to make matters worse, I was taken into protective custody by the Government of Burma on 12th July 1972 and released on 17th October 1973. I left Burma by air for Bangkok the same day and the next day went to Singapore. I was happy to get out of Burma and as I had no acquaintances in Singapore, my father told me to look up 9VINR and I stayed with his family while I worked from scratch to acquire my visa to USA.

Dr. Cnaran's daughter, Ranjit, and I took a liking to each other (frequency response?) and with our parents blessings, we were married on 10th February 1974 at this residence. I left for the States exactly a month later. I have sponsored Ranjit and she will get here by the end of the month. Here is one instance where amateur radio has brought two families together. And believe me, I thank you for it as you were instrumental in introducing a fellow ham from Singapore to my father. I did not even know that he had a daughter, Hi! I am enclosing a picture of us taken on our wedding day. I am working as a technician in Springfield for Ford and have rented an apartment in Rochester, Illinois. My father thinks that our marriage would be good publicity for Hams all over the world.

My best wishes to you and hope to hear from you soon.

Gurbux Singh
Rochester IL 62563

MURPHY'S LAW

AS IT APPLIES TO SYNTHESIZERS

General Engineering

1. Any idea to make it better will be preceded by someone else a week earlier.

2. The more simple a design change appears, the further its influence will extend.

Specifications

1. In specifications, Murphy's Law supercedes ohm's.

2. For anybody's cost estimate, your cost will exceed the estimate by a factor of 3.

Building and Wiring

1. Any wire cut to length will be too short.

2. Identical units tested under identical conditions will not be identical in the field.

3. The availability of a component is inversely proportional to the need for that component.

4. If you need components, you will be able to get n-1 parts.

5. A dropped tool will land where it can do the most damage. (Also known as the law of selective gravitation.)

6. Interchangeable parts won't.

7. If the first one works, subsequent units will malfunction.

8. The most delicate component will drop.

9. If a circuit can't fail, it will.

10. A transistor protected by a fast-acting fuse will protect the fuse by blowing first.

11. A self-starting oscillator won't.

12. A crystal oscillator will oscillate at the wrong frequency — if it oscillates.

13. An NPN transistor will be a PNP.

14. If an obviously defective component is replaced in a synthesizer with an intermittent fault, the fault will reappear after the unit is buttoned up.

About the author:

Mr. Edsel Murphy is a victim of his own Laws. Destined for a place in the engineering Hall of Fame, something went wrong.

In fact, the Law first came to him in all its simplicity when his bride-to-be informed him of the impending birth of an heir to the family fortunes. (Reference EEE, Vol 15, No. 8 Aug. 1968 by D.L. Klipstein)

Submitted by Leo WA1HSO

Submitted by:
Michael Kresila
Box 57
Marion OH 43302

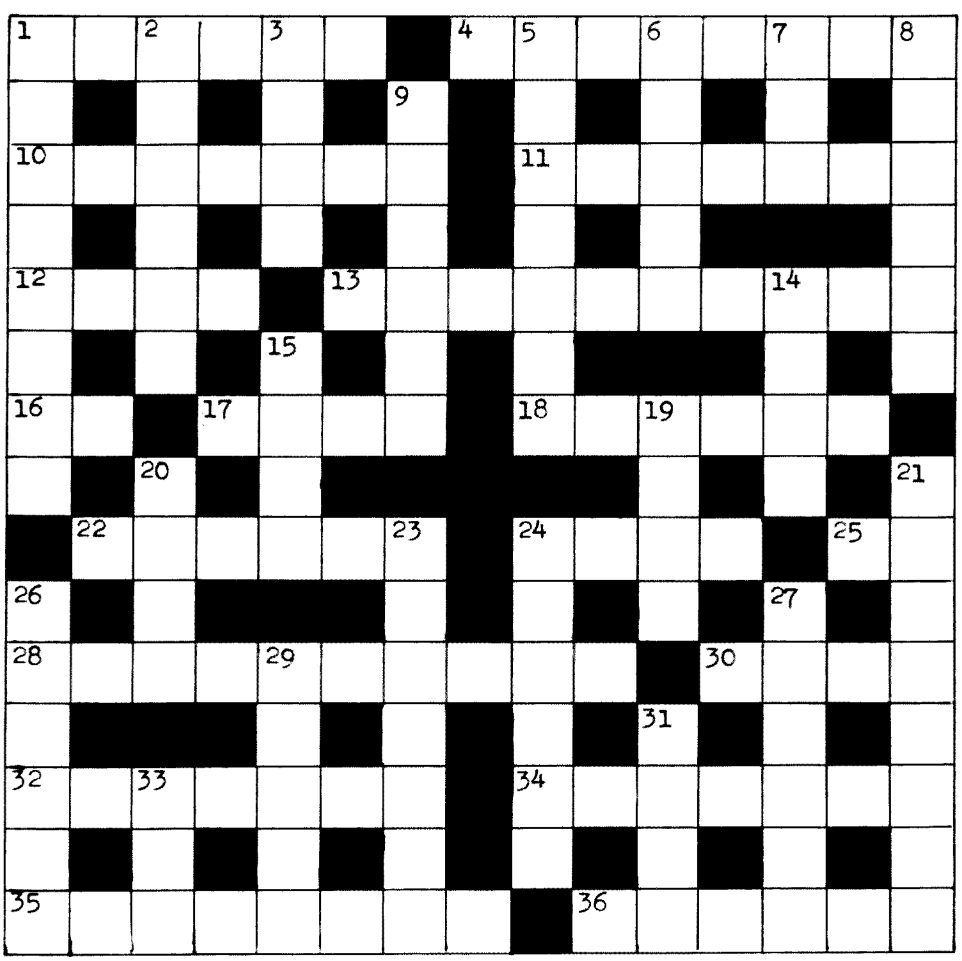
PUZZLE

ACROSS

1. Sudden current or voltage changes in a circuit.
4. Used in the grid circuit of a vacuum tube to provide a necessary voltage.
10. The unit of luminance.
11. Unit of magnetic intensity or magnetizing force equal to one gilbert in one centimeter.
12. The pitch, duration, or both of a tone sensation.
13. A glow lamp that produces intense flashes of light when fed with timed voltage pulses.
16. Above.
17. A device used in some mechanical television systems to modulate a light beam with television signals.
18. Standard screw-thread base used for electric lamps.
22. Also called a needle.
24. A unit of loudness.
25. Short for address system.
28. The ease with which an alternating current flows in a circuit.
30. Breathing device.
32. Potential difference or voltage.
34. A cathode-ray tube developed in England.
35. The superposition of one image onto another (e.g., in the formation of an interlaced scanning raster).
36. The positive nucleus of the hydrogen atom.

DOWN

1. A chemical element used as a rectifier layer in metallic rectifiers.
2. Any system of control performed from a distance.
3. Level.
5. Variations of a chemical element, each having the same atomic number but differing in atomic weight.
6. A device that contains and delivers power to move a control.
7. Eastern Standard Time. Abbr.
8. A loading.
9. The Stationary plates of a variable capacitor.
14. A number which, when multiplied by itself a number of times, equals a given number.
15. Elementary unit of storage.
19. Electrically charged atom or group of atoms.
20. To stop a flow.
21. An alloy wire used in precision wire-wound resistors because of its low temperature coefficient of resistance.
23. The part of a transmitter that translates the densities of the elemental areas of the subject copy into signal-waveform.
24. An opening that supports and electrically connects to vacuum tubes or components when they are inserted into it.
26. The spring fastened around the drum to hold the record sheet or copy in place.
27. A rotatable device on which one or more pretuned circuits are mounted for use in all-wave receivers.
29. Identical pair.
31. An array of antenna elements, one above the other.
33. Negative. Abbr.



SOLUTION ON PAGE 141

Caveat Emptor?

Price – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

PERSONAL ATTENTION plus the best cash deal anywhere is what you receive at QUEEN CITY ELECTRONICS in the heart of the Midwest. Queen City carries all major brands including Drake, Tempo, Kenwood, Yaesu, Swan, Regency, Clegg, Standard, ICOM, Genave.... write or phone us for your equipment needs. Queen City Electronics, Inc., 7404 Hamilton Avenue, Cincinnati, OH 45231 (513) 931-1577.

TECH MANUALS for govt. surplus gear – $6.50 each: R-390/URR, R-220/URR, URM-25D, CV-591A/URR, CV-278/GR, TRM-1, TS-382D/U, TS-497B/URR, TT-63A/FGC, URM-32. W3IHD, 7218 Roanne Drive, Washington DC 20021.

LEARN DESIGN TECHNIQUES Electronics Monthly Newsletter. Digital, linear construction projects, design theory and procedures. Sample copy $1.00. Valley West, Box 2119-E, Sunnyvale CA 94087.

BUY-SELL-TRADE Write for monthly mailer. Give name address call letters. Complete stock of major brands new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc. SSB and FM. Associated Radio, 8012 Conser, Overland Park KS 66204. 913-381-5901.

VERY INTERESTING! Next 5 issues $1. "The Ham Trader," Sycamore Il 60178. (Ask about our "HAM EQUIPMENT BUYERS GUIDE" covering Receivers, transmitters, transceivers, amplifiers 1945–74. Indispensable!)

ELECTRONIC SURPLUS – resistors 1/4 and 1/2 watt 5¢, capacitors 10¢, tube and solid state components. Catalog 10¢. SASCO Electronics, 1009 King St., Alexandria VA 22314.

FREE: 12 extra crystals of your choice with the purchase of a new Regency HR-2B at $229. Send cashier's check or money order for same-day shipment. For equally good deals on Collins, Drake, Kenwood, Standard, Clegg, Swan, ICOM, Genave, Hallicrafters, Tempo, Midland, Ten-Tec, Venus Hy-Gain, CushCraft, Mosley, and Hustler, write to Hoosier Electronics your ham headquarters in the heart of the Midwest. Become one of our many happy and satisfied customers. Write or call today for our low quote and try our individual, personal service. Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. (812) 894-2397.

YOUR SWAP-N-SELL ads run free in TRADIO, a public service publication of Wichita Amateur Radio Society Box 4391 Wichita Falls TX 76308.

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding, literature Estes Engineering, 543-A West 184 Street, Gardena CA 90248.

FOUNDATION for Amateur Radio annual hamfest Sunday, October 20, 1974 at Gaithersburg Maryland Fairgrounds.

MOTOROLA PORTABLES Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal services, 6663 Industrial Loop, Greendale WI 53129.

CALL LETTER LICENSE PLATES – still being collected by 73 Magazine for possible cover use. Please send in an old call letter plate – most treasured are out-of-district plates such as W2NSD/NH, etc. Got any real oldies? 73 Magazine, Peterborough NH 03458.

JIG SAW PUZZLES wanted. If you have any old wooden jig saw puzzles in your attic – or run across them at an auction (they go for 25¢ usually), please keep in mind that Wayne Green collects them and might even pay a buck a peice for them. c/o 73 Magazine, Peterborough NH 03458. Wood, not cardboard – and complete.

WANTED: General Class (or higher) hams to join 4,500 member Morse Telegraph Club. Hundreds of hams already belong. Send modest $3 annual dues (includes subscription to great slick paper newspaper "Dots and Dashes") to GST A. J. Long, 520 West Schwartz Street, Salem IL 62881 for membership card and assignment to nearest chapter.

TRADE: Collins 390A and manual for late model transceiver – write what you have George Keys WA6KAA, 1334 N. Broadway, Santa Maria CA 93454. 805 925-7755.

CU-286/FRR-33 – New Collins 1-32 MHz antenna/receiver tuner coupler with autotune circuit for remote operation. With schematic and power connector, $50. WA1TEJ, 100 Granite St., Londonderry NH 03053.

REGENCY TMR-16H/L/UHF executive scanner, like new, never used since unpacked. Covers 2, 6 and 3/4 meter FM activity. $125 sacrifice. WA1TEJ, 100 Granite St., Londonderry NH 03053.

AN/ARC-27 – Two complete (fixed or mobile) 220 MHz systems: Two RT-178/ARC-27 Collins Synthesized transceivers (200-399.9 MHz), various control boxes, cables, connectors, shock mount, blade antenna, spares and manual. Units can be interconnected to operate repeat or used as mobiles, control stations or U.S. military monitor sets. $200. WA1TEJ, 100 Granite St., Londonderry NH 03053.

WANTED: CV-89A/URA-8A in good condition with cabinet (must be working) or AN/URA-17 Comparator Converter Group; brackets for mounting CV-89 in 19" rack. Write WA1TEJ, 100 Granite St., Londonderry NH 03053.

FOR SALE: Heath HW101 transceiver aligned at factory, HP23B AC Power Supply, SB600 Communications Speaker, HM102 RF Power meter. all in excellent condition, one year old. Also Turner 454C SSB Ceramic Microphone, excellent condition. Best offer takes all. Ben Johnson, RR1 Box 117 Apt. 2, O'Fallon IL 62269.

NOW PAYING $2000.00 and up for ARC-94/618T ARC-102/618T. $1200.00 and up for ARC-51BX. $1500 and up for 490T-1 antenna couplers. We also need these control boxes – C-6287/ARC-51BX C-6476/ARC-51BX C-714E-2. We also need R-1051 receivers RT-662/Grc-106 transceivers. We buy all late aircraft and ground radio equipment. Also pack radios. We are buyers not talkers. Bring your equipment in, you are paid on the spot. Ship it in, you are paid within 24 hours. We pay all shipping charges. If you want the best price for your equipment, call us. Call collect if you have and want to sell or trade. We also sell. What do you need? D&R Electronics, R.D.1 Box 56, Milton PA 17847. Phone 717 742-4604. 9:00AM – 9:00PM.

AN/FRR-23 (AN/SRR-13) general coverage modular receiver with book, excellent condition. $100. WA1TEJ, 100 Granite Street, Londonderry NH 03053.

RCA SENIOR VOLTOHMYST – professional grade VTVM, new, never used. $50. WA1TEJ, 100 Granite St., Londonderry NH 03053.

EQUIPMENT CLOSEOUT

The following equipment has been purchased by 73 Magazine for test or has been received in lieu of payment for ads. Most gear is either brand new in the original cartons or else like new after a few days of testing in the 73 labs.

MITS 908M Calculator w/p.s./case ($143) new	$ 79
Vanguard Scaler –÷ by 10 – to 200MHz ($120)	$ 75
Pickering CW keyboard KB-1 ($265) tested	$ 155
Motorola KW 2m amplifier–used	$ 375
Heath IC-2009 calculator–brand new ($92)	$ 79
Signal One CX7-A–tested–perfect–like new–fantastic	$1989
Concord video monitor VM-12–tested ($400)	$ 199
Concord all channel TV tuner Dem-911 ($800)	$ 199
Regency 450 MHz scanner–($200)–like new	$ 139
Varitronics PA-50 2m amp ($110) brand new– 10w in 50 Wout	$ 89
RP tone burst gen–5 freq TB-5–exc ($37.50)	$ 25
Regency HR-6 ($240) six meter 10w xcvr 12ch	$ 189
Regency ACT-R8H/L Scr ($160) VHF/UHF 8ch scr receiver	$ 129
Standard SR-C826MA ($398) Latest model 10w 12ch 2m xcvr	$ 329
Regency HR-2MS ($319) 2m 15w xcvr with 8ch scanner	$ 259
SBE SB-450TRC ($180) 450 MHz transverter	$ 139
Regency Pocket scanner 4 channel ACT-P4H ($120)	$ 89
Cobra 220 MHz Transceiver 10w 12ch ($300)	$ 255
Standard 14 U 2m 22ch superfantastic rig, VOX ($510) demo	$ 429
Pacificom 2m HT–brand new–($250)	$ 189

All Prices fob: UPS collect.
73 Magazine – Peterborough NH 03458

ROCHESTER NY – Hamfest date for 1975 – May 31st. Marriott Inn is new headquarters. Information? Write WNY Hamfest, Box 1388, Rochester NY 14603.

DESIGN ENGINEERS. Our expanding Atlanta based electronics company has several opportunities for BSEEs or MSEEs Design Engineers to join our group dedicated to the design and development of satellite communications equipment. We are seeking candidates for these positions who are hardware oriented engineers with background in some of the following areas: Solid State Microwave low-noise and power amplifiers; Frequency converters; Analog & Digital modems; IF Circuitry; Base band processing circuitry; Frequency sources; MIC Techniques. To explore these excellent career opportunities, please call collect to: Bob Placek or Jim Wallace 404-938-2930. Or send resume in confidence to: Personnel Manager, Scientific-Atlanta, Inc., P.O. Box 13654, Atlanta, GA 30324. An equal opportunity employer.

REWARD! Ten dollars reward for return of 73 Magazine flag lost at Dayton.

REGULATED POWER SUPPLIES 13.8 volt 3% regulation. 3.5 amp – 34.95 7 amp 59.95. Also 1, 14, 25 amp. Meters available. Enterprise Electronics, Box 61, Monroe OH 45050.

WANTED: Cash for a good automatic voltage regulator, also need a transceiver, band scanner, antenna rotator, transmatch. Albert, 304 East Courtland, San Antonio TX 78212.

PERSONAL ATTENTION plus the best cash deal anywhere is what you receive at QUEEN CITY ELECTRONICS in the heart of the Midwest. Queen City carries all major brands including Drake, Tempo, Kenwood, Yaesu, Swan, Regency, Clegg, Standard, ICOM, Genave... write or phone us for your equipment needs. Queen City Electronics, Inc., 7404 Hamilton Avenue, Cincinnati OH 45231 (513) 931-1577.

DRAKE: 2B, 2BQ, 2AC. All 10 meter crystals, plus 5 extra crystals (WWV etc.) manual. Excellent condition package $175.00. Call Jim W1VYB 617 922-3850.

AUTOPATCH – Using your Touch-Tone pad, key your transmitter without holding P.T.T. switch. 1½ to 2 sec delay. G-10 glass P.C. board, schematic, pictorial, and parts list. $2.50 plus C.O.D. WB6FXF Rick 1613 E. Portola Avenue, Santa Ana CA 92701 or call 714 836-9363.

TT-513/FR – Solid-State RTTY non-impact teleprinter, accepts all speeds, excellent condition with manual and connector. $150. WA1TEJ, 100 Granite Street, Londonderry NH 03053.

CANADIANS – We stock a broad line of electronic parts, including solid-state. Send for free flyer, DARTEK ELECTRONICS, Dept. 7, Box 2460, Dartmouth, Nova Scotia.

FM-27B and homebrew power supply $325. Clean, used as base station. WA2VWM Dave 1420 York Avenue, New York NY 10021. 212 734-4135 (After 1800).

BUILD a 200MHz frequency counter. 8 digit LED readout. Drilled boards with instructions for 20MHz counter $25. 200MHz prescaler option $3.50. Manual only $5.00. DAVIS ELECTRONICS, 6 W. Oakwood Buffalo NY 14214.

SOLID STATE components, readouts and LEDs. Free flyer. DAVIS ELECTRONICS, 6 W. Oakwood, Buffalo NY 14214.

FM WIRELESS mike transmitter kit $2.00. DAVIS ELECTRONICS, 6 W. Oakwood, Buffalo NY 14214.

250MHz prescaler board. Drilled, with instructions $3.50. DAVIS ELECTRONICS, 6 W. Oakwood, Buffalo NY 14214.

WANTED: Drake AA-22 2MHz FM transmitter receiver amplifier; perfect operating condition only. Howard Pence, 524 S. Washington, Montpelier IN 47359. Phone 317 728-2588.

VOLUNTEER needed in Orange, California area to handle traffic for Bible translators. Also need RTTY gear; tax deductable. WA8BHR, 4466 Burtch, North Street, MI 48049.

FOR SALE:Thriving 2-way Buisness in medium size Midwest market. $40,000.00 annual Gross. For further information write c/o Box J, 73.

TV-3B/U NAVY portable tube tester, good working condition. $25. WA1TEJ, 100 Granite St., Londonderry NH 03053.

TUBE WARRANTY CLAIMS

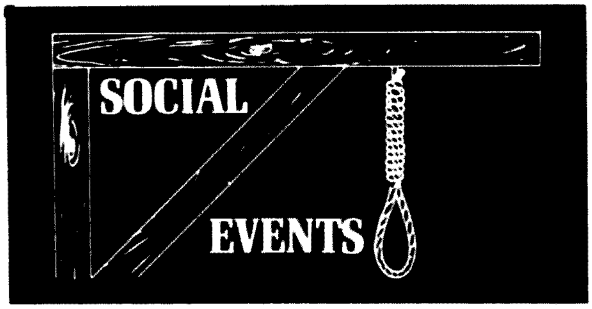
Although the price of receiving-type tubes is quite low, and a 12AX7 won't break very many of us, the enlightened amateur will check the warranty information on his tubes carefully.

Most tubes are guaranteed for two years from date of manufacture, with a six-month shelf life allowance. If the tube gives unsatisfactory service, except for burned-out filaments or breaks, the manufacturer will generally replace the tube.

At WA6CPP I have had occasion to return two tubes to my friendly parts house in the past month. Covered by the warranty, these were promptly and cheerfully replaced. The $6 saving, while not much, can be budgeted for other essential items often needed.

It is a good idea to check the tubes on receipt, running them for a week or so to see if they are working properly. Also, be sure to hang on to the invoice the counterman gives you, in case there arises a question whether you got the tubes there or from the supermarket machine.

...WA6CPP



MEMPHIS TENN, OCT 6

The Mid-South Amateur Radio Association is sponsoring the Memphis Hamfest on Sunday October 6 at State Technical Institute, 1-40 at Macon Rd (Exit 11). Seminars, demos, displays, XYL program, prizes, flea market, fun. Talk in 3980, 34/94, and Army Mars. Trailers and campers hookup at Welcome Inn across street. Holiday Inn there too.

SAN DIEGO NOV 1–3

ARRL SW Division convention – Town and Country Hotle – talk in 34-94, 3900, 7250. $5.50 registration, $9.75 banquet. Write Box 82297, San Diego CA 92138 for info and pre-registration details.

BERMUDA Oct 13-20

This is amateur radio week in Bermuda. Oct. 16th: annual meeting of the Radio Society of Bermuda. Oct 18th: annual RSGB dinner at Holiday Inn, St.Georges honoring the winners of the Bermuda contest. Oct. 19-20 portable operation of VP9Bs in the Scout Jamboree. To get a license to operate in Bermuda write to the Radio Society of Bermuda, Box 275, Hamilton Bermuda. Travel and lodging should be arranged with your local travel agent.

EL PASO TX OCT 12-13

Hamfest and swapmeet – seminars, prizes, flea market. Info: WB5CMB, 7772 Gran Quivira, El Paso TX 79904.

WINNIPEG MAN. OCT 5-6

Hamfest "74," International Inn, Winnipeg. Reg to VE4RL, Box 352, Winnipeg Man. Can. R3C 2H6 $1 ea. Dinner and dance Sat. $4 each. Hotel $24 couple special. Xmtr hunt, mobile contest, homebrew contest, XYL events, big prizes, auction.

GAITHERSBURG MD OCT 20

Foundation for Amateur Radio annual hamfest at the Gaithersburg Fairgrounds. Flea market, exhibits, events, many prizes, picnic grounds and free parking. For infor write or call Bill Miller K4MM, 10919 Woodfair Road, Fairfax Station, VA 22039, 703 273-0112.

WEST GHENT NY OCT. 5

Northeast States 160 Meter Association annual fall meeting at Kozel's Restaurant, West Ghent (near Hudson). Flea market, dinner, prizes, starts 2 pm. Dinner $5.75 ea. – reservations: W1JEC, Box 44, West Granby CT 06090.

QCWA NATIONAL CONVENTION
Disney World

October 25-26 – make plans now to attend this QCWA National. Write W4UKA, 635 SE 19, Ocala FL 32670.

SO. SIOUX CITY NB, OCT 4-5-6

The ARRL Midwest Convention will be held at the Marina Inn, South Sioux City NB sponsored by the 3900 Club. Theme – tribute to handicapped amateurs. Friday noon start. QCWA dinner, portable repeater, SSTV, ATV, Amsat demo, QRP session, ARRL forum, repeater forum, traffic forum, flea market, Mars, exhibits. $7 reg to WØEQN 3818 5th Avenue, Sious City IA 51105. Banquet $6.

CIRCUITS, CIRCUITS, CIRCUITS

A SIMPLE PULSE GENERATOR USING THE SIGNETICS 555 TIMER

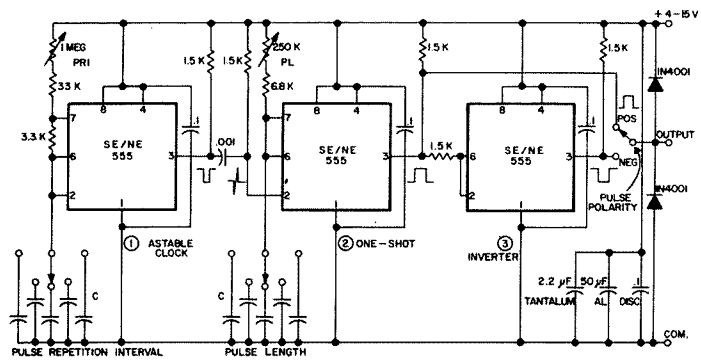
Christer Falkenstrom SM4DZR
Box 120
S-660 80 Fagerds
Sweden

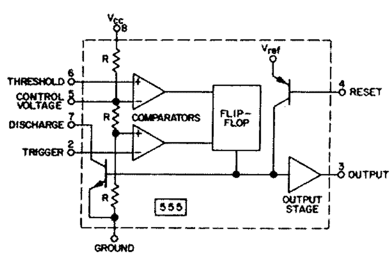
The following circuits have appeared in the reference books, magazines, application notes, etc. While we try to reproduce all of the information that should be needed by an experienced constructor, readers may want to avail themselves of the original sources for peace of mind.

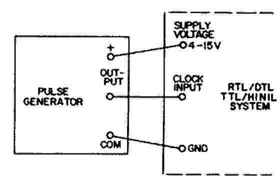
Readers are requested to pass along any interesting circuits that they discover in sources other than U.S. ham magazines. Circuits should be oriented toward amateur radio and experimentation rather than industrial or computer technology. Submit circuit with all parts values on it, a very brief explanation of the circuit and any additional parts information required, give the source and a note of permission to reprint from the copyright holder, if any, and the reward for a published circuit will be a choice of a 73 book. Send your circuits to 73 Circuits Page, 73 Magazine, Peterborough NH 03458.

This pulse generator is a very useful tool. It is mainly intended to be used as a variable clock when breadboarding or testing digital IC systems, especially at low clocking rates. Due to the wide range supply voltage allowed for the SE/NE555 it can be used with RTL, DTL, TTL, and HiNil. It uses the existing system voltage, anything between +4 and +15V. This circuit comprises three 555 Timers.

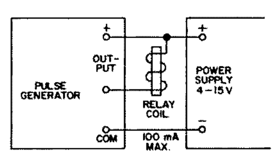
The first 555 is connected as an astable clock. The leading edge of the negative output pulse is used to trigger the second 555. This is connected as a one-shot and delivers a positive-going pulse which is used as the positive output. The third 555 is connected as an inverter to generate the negative-going output pulse. This pulse appears about 4μ after the positive pulse has started. The rise and fall times are about 100nS. Output currents are 100mA and more. With a load of 1 KΩ between output and +V_{CC} the current drawn by the complete circuit is 17mA at 5V, and 52mA at 15V. In the prototype ten heavily overlapping ranges were chosen, mainly depending on the availability of 10-way selectors. The following table shows the capacitor values and the corresponding PRI and PL ranges achieved. These values are by no means circuit limitations, the timing can be extended to minutes with suitable capacitors.







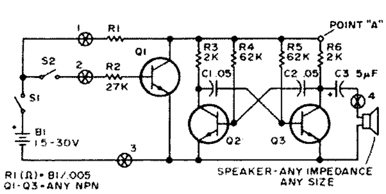
CONNECTING THE PULSE GENERATOR TO A DIGITAL SYSTEM

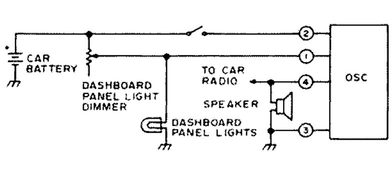


DRIVING A RELAY

C:	PRI		PL	
.0022 μF	70 μS –	1 6 mS	15 μS –	580 μS
.0047 μF	130 μS –	3,7 mS	34 μS –	1,3 mS
.01 μF	280 μS –	8,1 mS	71 μS –	2,8 mS
.022 μF	600 μS –	17 mS	165 μS –	6,6 mS
.047 μF	1,4 mS –	40 mS	350 μS –	14 mS
.1 μF	2,8 mS –	78 mS	770 μS –	30 mS
.22 μF	6,1 mS –	172 mS	1,7 mS –	67 mS
.47 μF	12 mS –	360 mS	3,1 mS –	122 mS
1 μF	30 mS –	810 mS	8 mS –	330 mS
2,2 μF	62 mS –	1,76 S	17 mS –	700 mS

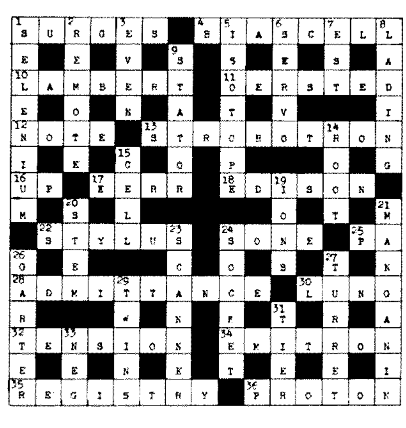
USEFUL OSCILLATOR





S1 turns on osc. S2 turns it off. Uses are many – such as an auto headlight reminder, sidetone oscillator, code osc., square wave generator, etc. For auto headlight reminder connect 1 to the dashboard panel lights, 2 to the car battery via S2, 3 to ground and 4 to the car radio speaker. Voila! Thanks W7BBX.

ANSWER TO PUZZLE



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OCTOBER 1974

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J.H. Nelson

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October – 1974

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	$\boxed{3}$	$\boxed{4}$	$\boxed{5}$
6	7	8	9	10	11	12
$\boxed{13}$	14	15	16	17	18	19
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27	$\boxed{28}$	$\boxed{29}$	$\boxed{30}$	$\boxed{31}$		

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	7	3	3	3	7	7	14	14	14
ARGENTINA	14	7B	7B	7B	7	7	14	21	21	21	21	21
AUSTRALIA	14	7B	7B	7B	7B	7B	7B	14	14B	14B	14	21
CANAL ZONE	14	7	7	7	7	7	14	14A	21	21	21	14A
ENGLAND	7	7	3	3	7	7	14	14A	14A	14	14	7
HAWAII	14	7B	7B	7	7	7	7	7B	14B	14	14A	14A
INDIA	7	7	7B	7B	7B	7B	14	14	7B	7B	7	7
JAPAN	14	7B	7B	7B	7	7	7	7	7	7B	7B	14
MEXICO	14	7	7	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14	7B	7B	7B	7B	7B	7	7A	7	7B	7B	7B
PUERTO RICO	7	7	7	7	3A	3A	14	14	14	14	14A	14
SOUTH AFRICA	7	7	7	7	7B	14	21	21	21	21	14A	14
U.S.S.R.	7	3	3	3	7	7B	14	14	14	14B	7B	7
WEST COAST	14	7	7	7	7	3A	7	14	14	14	14A	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7A	7	7	3	3	3	7	7	14	14	14
ARGENTINA	14	7B	7B	7B	7	7	7B	14	21	21	21	21
AUSTRALIA	21	14	7B	7B	7B	7B	7B	7	14B	14B	14	21
CANAL ZONE	14	7	7	7	7	7	7	14A	21	21	21	21
ENGLAND	7	7	3	3	7	3	7B	14	14	14	14	7
HAWAII	14A	14	7	7	7	7	7	7	14B	14A	21	21
INDIA	7	7B	7B	7B	7B	3B	3B	7	7A	7	7	7
JAPAN	14	14B	7B	7B	3A	7	3	7	7	7B	7B	14
MEXICO	14	7	7	7	7	3	7	7A	14	14	14	14
PHILIPPINES	14	14	7B	7B	3B	7B	3B	7	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7A	14	14A	14A	21	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14A	14
U.S.S.R.	7	3	3	3A	7	3A	7B	14	14	7B	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7A	7	7	3	3	3	7	7	7A	14	14
ARGENTINA	14	14	7B	7B	7	7	7B	14	21	21	21	21
AUSTRALIA	21	21	14	7B	7B	7B	7B	7	7	7B	14	21
CANAL ZONE	14	7A	7	7	7	7	7	14	21	21	21	21
ENGLAND	7	7	3	3	7	3	3B	7	14	14	14B	7B
HAWAII	21	21	14	7	7	7	7	7	7A	14A	21	21
INDIA	7	14	7B	7B	3B	3B	3B	7	7	7	7	7
JAPAN	14	14	14B	7B	3A	7	7	7	7	7B	14B	14
MEXICO	14	14B	7	7	7	7	7	7A	14	14	14A	14A
PHILIPPINES	14	14	14	7B	7B	7B	7	7	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7	14	14	14A	21	21
SOUTH AFRICA	7B	7	7	7	7B	7B	7B	14	14	14	14A	14
U.S.S.R.	7	3	3	3A	3	3	3	7	7A	7A	7B	7B
EAST COAST	14	7	7	7	7	3A	7	14	14	14	14A	21

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

AMATEUR RADIO 73

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NOVEMBER 1974

IGITAL
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BIG CONTEST

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IGITAL
IND INDICATOR

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M PREAMPLIFIER

ND MUCH,
MUCH MORE

BARRY GOLDWATER, K7UGA,
LOVES TO CHEW THE FAT

#170 NOVEMBER 1974

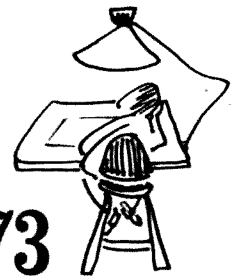
73 AMATEUR RADIO

FEATURES

COVER STORY: An inside look at the club whose members spent so many dedicated hours completing phone patches for airmen overseas. Senator Barry Goldwater, above, is one of its members.

CONTENTS

73 Magazine is published monthly by 73, Inc., Peterborough, New Hampshire 03458. Subscription rates are $7 for one year in North America and U.S. Zip Code areas overseas, $8 per year elsewhere. Two years $12 and $13 overseas. Three years, $15, and $16 overseas. Second class postage paid at Peterborough, New Hampshire 03458 and at additional mailing offices. Phone: 603-924-3873. Microfilm edition of 73 available from University Microfilms, Ann Arbor MI 48106. Magnetic tapes available from Science for the Blind, 332 Rock Hill Rd., Bala Cynwyd PA 19904. *Entire contents copyright 1974 by 73 Inc., Peterborough, NH 03458.*



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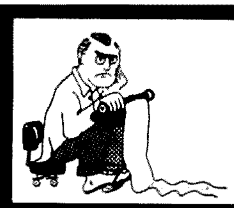


NEVER SAY DIE

...de W2NSD/1

EDITORIAL BY WAYNE GREEN

PAYING THE FREIGHT

Inflation is doing fine, as you know. In the ham rag business we notice the frequent increases in paper prices, printing prices, postage and salaries for staffers who go to the A&P expecting to say WeeeO, but instead say WOW!

Our subscription rates will inch up a tad, but this isn't enough. We can't raise our advertising rates too much without hurting all of those small companies who depend heavily on 73 to bring them customers.

After a lot of thought — and figuring that a page of ads in 73 will pay for almost three pages of articles and news — the obvious solution was to encourage non-ham advertisers to help pick up the tab. Since most hams wear pants, the Haband ad last month seemed like a good start — and we are very familiar with their amazingly good clothes. We think the Haband pants and shoes are one of the best bargains around, possibly with the exception of the 73 subscription rate.

The advertising department is working on a few more surprises like that, all of which means a thicker magazine for you and a lot more articles. Oddly enough, the cost of reaching prospective customers via 73 is incredibly low — much lower than most companies in other fields believe is possible. This may have something to do with our running the magazine from one of the United States' low rent districts.

ANTENNA GADGETEERS ARISE

Not since the olden days when Sam Harris (W8UKS and W1FZJ) was playing around with his 75m bi-square beams has much been done to develop gain on that band — at least as far as the work resulting in any articles of value to antenna experimenters.

The fact is that during these unsunspot days quite a few of us would be interested in some antenna info for the lower bands. Has anyone been working on this? Perhaps someone has tried out a twin-three antenna on 75m? Let's see some work on this and some articles.

I remember all too well how Sam used to work all over the world on 75m with 50 watts and his bi-square — and how my kilowatt and dipole was quite a few dB down in South Africa and Europe. It seems like some new work *must* have been done in the last twenty—five years on antennas for 75m.

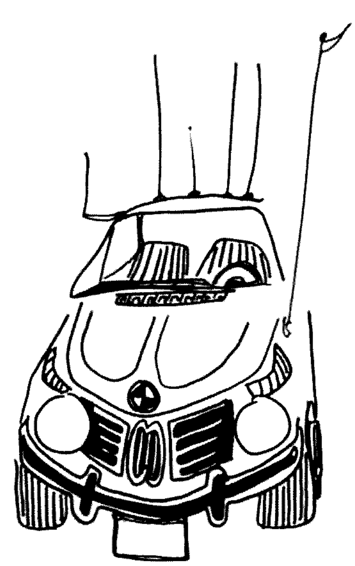
ARTICLES WANTED

A newspaper clipping sent in by reader Joecks from up in Vermont tells about a chap who has hooked up his phone so he can turn on his air conditioning by remote control. Hmmm. Seems this chap uses a Touchtone pad and has thirty different things he can do by remote control. Why anyone would want to turn on his television set by remote control is probably not worth a lot of consideration — the reason is probably simple — just to be able to do it.

The ham applications are many (obviously) and I think a few of the 73 readers might like to whomp up something like this, if there are any builders out there with more time and ICs than they need to do a minimum while waiting out their lives.

Some of us would like to be able to call home and tone on the 2m rig and monitor the local channel — maybe even be able to call in and casually describe the process, with just that right sigh of slight boredom.

Tell you what — you build up the gadget and we'll print the article. And you think up the clever applications.



Bill Pasternak WA2HVK/6
14725 Titus St. #4
Panorama City CA 91402

In a recent T.V. Guide interview, F.C.C. Chairman Richard Wiley stated that he was opposed to unnecessary regulation of the broadcast media. Based on some of the newly proposed legislation regarding amateur radio, it is becoming obvious that Commissioner Wiley and the FCC are really listening to us and that his opposition to unnecessary regulation is being extended to us also. Therefore, if no one else has said it yet, a hearty thank you Chairman Wiley from those of us who make up the amateur radio community.

Some of the legislation I speak of, which by the time you read this may have been enacted, was released in docket form on July 25 as dockets number 20112 and 20113 respectively. 20112 deals with permitting automatic remote control of amateur repeaters while 20113 is designed to ease restrictions against cross – band operation of repeaters. The latter is based on a petition filed by the ARRL (RM 2337) while the former, 20112 can in good part be credited to hard work on the part of the Southern California Association and especially its Vice – Chairman Dick McKay K6VGP.

Late in 1973, Dick approached the F.C.C. for permission to experiment with a control system on the repeater's input channel. In January of this year, Dick was granted a six month "Special Temporary Authorization" to experiment with a semi-automatic remote control system on his two repeaters WR6AAD and WR6AAE. It took very little time to prove that the concept was both valid and viable. But AAD and AAE are sub-audible tone access repeaters with limited membership. Could this same system work on a heavily populated open system? A short time ago Fred Deeg K6AEH repeater trustee for the Palisades Amateur Radio Club, applied for and was granted an STA to experiment with a fully automatic remote control system on the input to the club repeater WR6ABB. It was felt that the PARC machine with over half the club's membership using it daily plus a large number of non club members also communicating on it would make for an ideal test bed. Without being long winded about it, it worked perfectly! Based on this dual success, Dick prepared a petition asking that Part 97 be amended "To allow for the definition and operation of automatically remote controlled repeater stations"; doing so in the name of the Southern California Repeater Association. Shortly thereafter, 20112 was released and while it does not mention either Dick or the SCRA by name, it does thank those amateurs and organizations that experimented with semi-automatic and fully automatic remote control systems. Unless I miss my guess, we here in L.A. are those amateurs they are talking about. Dick, Fred and the rest of the SCRA have put in many long hours on this project, not just for those of us out here but for all of you. When 20112 is finally enacted it will be a giant step forward in providing again that round-the-clock operation that makes the amateur repeater one of the most valuable aspects of amateur radio.

Five days after 20112 was released your reporter flat on his back in Ceders-Sinai Medical Center – Mt. Sinai Hospital recovering from an attack of kidney stones; the seventh time in the same number of years. Now while no one likes to go to the hospital, least of all yours truly, there are times when these things cannot be avoided. However, Ceders-Sinai is unlike any other hospital I have ever been in and if ever the need arises again it is the place I will pick. They seem to believe if you treat a patient as a guest, carefully cater to a patient's needs promptly and most important keep the atmosphere cheerful, a person will recover a lot more quickly. From first hand experience I can tell you that it works, and works well. Most important to me, the food they served was not just good but better than many restaurants I have frequented. As to medical attention, it was the finest I have ever received and everyone on the staff went out of his or her way to make me as comfortable as possible. This then is my personal thank-you to those fine men and women who helped me recover so quickly, and to Denny WA6LVO for loaning me his KP202 HT to keep HVK/6 on-the-air while there.

A number of friends suggested that I get away for a few days to recuperate. My physician gave me a green light as long as I was back in time for some tests. Since Sharon's mom and dad were visiting from New York we decided to make Las Vegas our destination. Though I have been there a number of times in the past, I always flew there via Air-West and never had a radio with me. This time we drove and were never out of range of a repeater, a comforting thought when you cross the Mojave Desert and it's about 110 degrees outside. Since I live in the San Fernando Valley it was faster for us to head north on the San Diego Freeway (I-405) to the Newhall area and head out the newly completed Antelope Valley Freeway (Cal. 14). Heading out of town we QSO'd the AM rush-hour crowd on the WR6ABE Mt. Wilson Repeater (147.435 – 146.40) though once in the hills along 14 it was spotty. About 20 miles west of Palmdale we lost ABE completely. As we came down out of the hills and approached the Palmdale area we were able to access the .16 – .76 Table Mountain Machine located near Barstow. As we soon learned, WR6AFB does cover a large section of the Southern California Desert area along I-15 and Cal. 58. We were able to use it from Palmdale, through Mojave, Barstow finally loosing it while going through Mountain Pass at better than 4,000 feet, descending the eastern side. Scanning the eight available channels in my Sonar 3601, I came across a QSO on .28 – .88. Not having anything to add to the QSO, I just SWL'ed it into Las Vegas proper. Arriving at our hotel, we went QRT for the rest of the day. Since this was an overnight one day venture we were on the road the next morning. We found a machine on .34 – .94 and after a short QSO there went back to .28 – .88 and worked some stations there that filled us in on what machine covers what area of Las Vegas. .28 – .88 is the home of WR7ADZ, part of the famous Gronk Radio Network. Sitting atop Mt. Potosi, ADZ has almost phenominal coverage extending from St. George, Utah to the northeast and San Bernadino, California to the southwest. A quick look at a roadmap will give you a better idea of ADZ's coverage than my description here. I also personally can verify coverage to the southwest at least as far as the Cajon Pass on the return trip. Now that's what I call coverage!

WR7AEH on .34 – .94 is the local coverage machine designed for in town coverage. I found it could be accessed as long as the "Strip" was in sight from I-15. There are also two other machines in the Las Vegas area I was told. The .07 – .67 repeater covers north Las Vegas and a machine on 147.18 – 147.84 covers the western area. Due to lack of proper crystals I was unable to use these latter machines. WR7AEH is operated by the Las Vegas Radio Amateur Club while the two other machines are privately owned. All machines are

open carrier squelch and judging from those I worked while there, the Las Vegas area repeaters are inhabited by a friendly bunch of amateurs.

Well, the shows were great, and I made it home with the shirt still on my back. In fact I even came out a couple bucks ahead! Most of all, it was the kind of fun I needed to help forget the previous three weeks. Good old New York may call itself *Fun City*, but Las Vegas is also deserving of that same title. At least in my book.

de WA2HVK/6

SSTV SCENE

Dave Ingram K4TWJ
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Birmingham AL 35210

Is Slow Scan TV Dying?

Some serious questions have been raised on Slow Scan TV lately which deserve our utmost consideration. Is SSTV interest dwindling? Why are we not hearing more activity on the air? Is it a result of recently poor band conditions that seemingly isolate various SSTVers around the world or are newcomers merely replacing older enthusiasts who become bored due to the lack of interesting material on the air? Is SSTV interest great enough to attract commercial manufacturers or will they, like some others, fall by the wayside? We know many SSTVers are involved with experimentation more than actual operation because each years' knowledge gain is twice the previous year. We can scan convert pictures on *both ends* of a QSO, ASC II Typewrite messages on a SSTV screen, exchange color pictures and even span continents with these pictures. However, a means of communication is only as good as its use. More imaginative *operators* would be enthusiastically received on the air. Let's all try to work up more interesting pictures (if one picture is worth a thousand words, let's prove it!) and recruit more SSTV operators. Operators with gear ready to move in time of emergency can prove SSTV's full capabilities. Bring your thoughts out on the air. . .send me your comments. Let's not allow SSTV to fall into the "way out group" category by doing like so many people today. . .reading this, then forgetting it. Do so and SSTV will surely fade out.

Newcomers

Newcomers can now get started in Slow Scan TV quite easily. Used monitors are periodically appearing for around $200, the same price as many 2 meter rigs. Through Slow Scan TV you can see various places around the world, swap circuits over the air or see those items of interest many hams have. Does 2 meters offer this kind of excitement or do you find it fun to hear the same people say the same things every day.

An excellent way to get started in Slow Scan TV is the W6MXV kit unit which is available from Mike Tallant for around 100 to 150 dollars, depending on your junkbox. This unit is tops. Mike's detailed instructions, neat P.C. boards, X-Ray plans, etc., make it easier to construct than Heath gear! I built much of mine by carrying the boards with me, adding parts in my spare time and then soldering the connections at night. Recently I forwarded one of these kits down to WA2ZDF/CP1. Mike is really doing them up neat now. . .nice packing, large plans, gosh, it even includes the sync tuning tube! I don't know how he manages to break even on the kits.

Want to know more about what countries are on SSTV? Look over the following list of contacts from one of the DX leaders, Jack VE3GMT. There are around 90 countries presently on SSTV which means DXCC isn't far off. It's looking like the first certificates will be going to VE3GMT, W8YEK and W4MS. Any other challengers? What's your DXCC/SSTV total?

DJØCN	W. Germany
EA4DT	Spain
EA8CI	Canaries
EL2CB	Liberia
ET3DS	Ethiopia
F6AXT	France
FG7XT	Guadeloupe
FM7WW	Martinique
FO8DO	French Oc.
G3RHI	England
GC3YIZ	Guernsey
GI3NBB	N. Ireland
GW3DZJ	Wales
HA7LF	Hungary
HB9IT	Switzerland
HBØNL	Liechtenstein
HK3CF	Colombia
HR2HH	Honduras
I1BNT	Italy
IS1PEM	Sardinia
JA7FS	Japan
W4YK	U.S.A.
KC4DX	Navassa
KC4USX	Antartica
KH6HJF	Hawaii
KL7HAB	Alaska
KP4GN	P. Rico
KV4CM	Virgins
KX6DR	Marshalls
LA2BK	Norway
LU7AAG	Argentina
OD5HC	Lebanon
OE6GC	Austria
OK1NH	Czech
ON5SV	Belgium
OX3LP	Greenland
OY1M	Faroes
OZ4IP	Denmark
PAØLAM	Netherlands
PJ2CU	Antilles
PY1DCB	Brazil
PZ1DX	Surinam
SMØBUO	Sweden
VK5MF	Australia
VP2AR	Antigua
VP2ME	Monserrat
K4GXO/VP7	Bahamas
VP9GR	Bermuda
VQ9R	Seychelles
VU25KV	India
XE1JM	Mexico
YN3RBD	Nicaragua
YU2CDS	Yugoslavia
YU5AJ	Venezuela
ZF1TV	Cayman
ZC1AOY	N. Zealand
ZS6PP	S. Africa
ZS3B	S.W. Africa
4X4TW	Israel
6Y5GB	Jamaica
8RIW	Guyana
9K2AM	Kuwait
9Q5BG	Zaire
9X5PB	Rawanda
9Y4VU	Trinidad

Late additions into SSTV:

OA4F	JY8AA
HZ1SH	9V1RA
YU2CDS	W6AXE/KG6
DU1SS	AP2AD
OH2KT	VK9XX

Incidentally, you don't need an expensive rig to work SSTV: 90 percent of the DX stations show on 20 meters exclusively. A single bander SSB rig and, if you like, a single band homebrew linear amplifier are quite sufficient.

Scan Converter

Several Slow Scanners have asked how Slow-to-Fast Scan converted pictures look and if there are any simple shortcuts for accomplishing the same results. Not really! However a simple "visual coupler" could be constructed using an inexpensive closed circuit (Fast Scan) camera which has a "channel" rf output and your present SSTV monitor. Place the camera to view your Slow Scan monitor screen, then adjust contrast and brightness for optimum results. A hood or light-tight enclosure between camera lens and monitor screen would be advantageous in brightly illuminated rooms. Next, feed the camera's rf output to

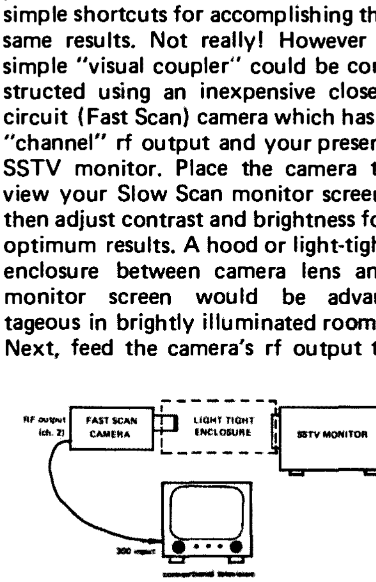
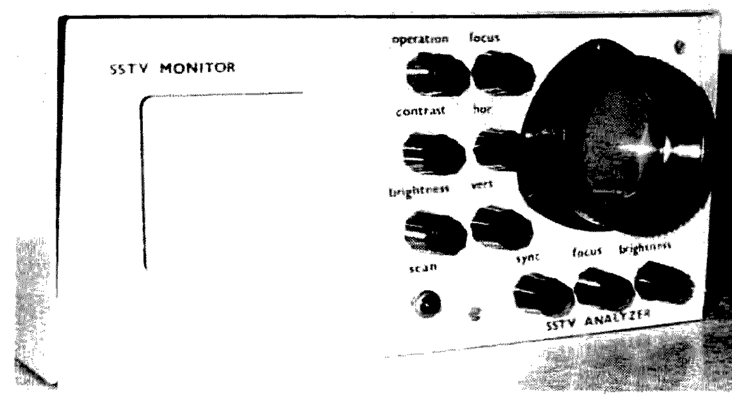
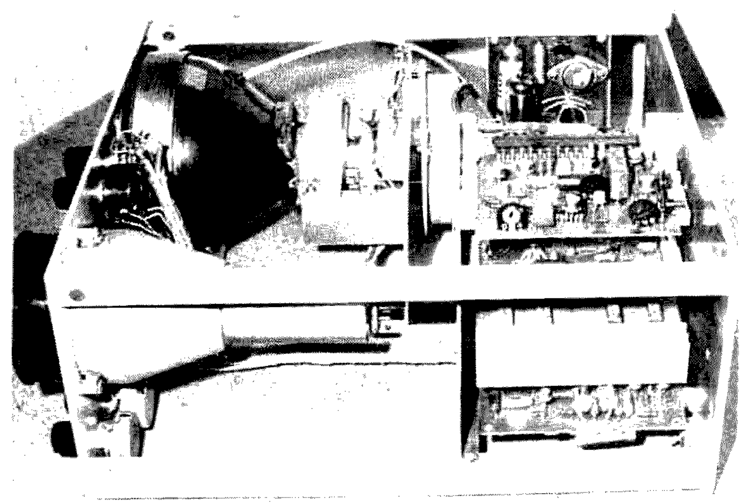


Fig. 1. Simple "Visual Coupler" SSTV converter.





Front panel and interior view of OK2PAD's homebrew monitor. Note the outstanding workmanship.

your regular TV and you can view large, bright pictures. Nice, eh?

Slow Scan TV activity in Czechoslovakia appears on the upswing, as reported by Franta, OK100. There are approximately 15 stations presently active on SSTV, with around 35 more interested and due to have gear going soon. The more active stations include OK1GW, OK3ZAS, OK2BNE and OK100. Their most popular frequency is 14.230 kHz. Although "Telsa" is their only manufacturer and IC availability is limited, transistors are rather plentiful. Shift Register memories are presently not available. Prices are high compared to our standards (would you work 7 or 8 hours to afford 3 or 4 simple ICs?) so amateurs must have a genuine interest before indulging in a SSTV venture. Their main SSTV cathode ray tubes are similar to our 5FP7 and use numbers like 13LM31, 25QP21 and 180QQ86. The first numbers appear to designate screen size in centimeters. Most of the fellows live some distance apart and work dilligently building their gear to reduce unnecessary components. OK3ZAS and OK2BNE, for example, are getting good results from the W7ABW camera while using regular vidicons.

This month's pictures are of OK2PAD's homebrew monitor and reveal outstanding workmanship. The unit uses a 13LM31 and much modified W6MXV circuit. Two emitter coupled transistors replace a CA3028 IC and sweep circuits are similar to W9LUO design. A WØLMD type video analyzer is included on the unit's right. The single tube visible behind the c.r.t. yoke is the high voltage rectifier.

A while back, Jack VE3GMT, suggested a monthly newsletter on SSTV. Interested parties could send info to him and he would get this out to all active SSTVers. He never received any letters! Come on now, aren't you proud of your accomplishments? How long does it take to scribble a short note? We are going to that same idea in this column, so drop me a card now on your new gear, DX worked, planned modifications or whatever. I'll get this right into the next month's column so we all will know more about "what's happening."

... K4TWJ

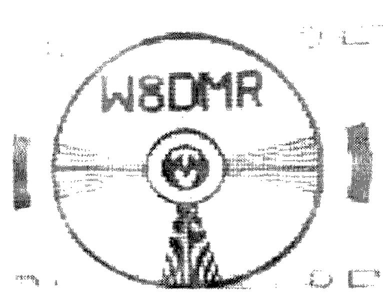
Exciting New Type of TV Tube

W.E. Parker W8DMR
2738 Floribunda Dr.
Columbus, Ohio 43209

I believe this is the first amateur television test pattern reproduced by the new solid state self-scanning image sensor. The sensor is a 100 by 100 element charged coupled device (CCD). Instead of the conventional vidicon camera tube employed in generating television pictures, a Fairchild CCD-201 was used. The 10,000 element self-scanning image sensor is mounted in a 24 lead dual-in-line package with an optical glass window. I believe the CCD's impact on TV cameras can be considered analogous to that of the transistor on vacuum tubes.

The image sensing elements are 1.2 mils by 0.8 mils located on 1.2 mil vertical centers and 1.6 horizontal centers. The light sensitive area is a 100 by 100 array of photo elements which provide an image aspect ratio of 4 by 3. In addition, the image sensing chip includes 100 columns of two-phase shift registers interdigitated among; the photo elements, a 102 unit two-phase analog output shift register, an output preamplifier, and a compensation amplifier. Charge coupled devices are a new class of semiconductor structures. When arrays of 512 by 512 elements are commercially available, the resolution wedges on the test pattern will be distinct from the outer circle to the inner circle.

... W8DMR



Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

AMSAT-OSCAR-B before final thermal-vacuum testing of the spacecraft. The ten-meter antenna (provided by Amatek-Hunter Spring), and 2304 MHz quadrifilar antenna (furnished by RCA Astro-Electronics Div.) are on the top of the spacecraft. With the spacecraft is Elizabeth, XYL of WA3LND.

Oscar 6 orbiting information for November.

Orbit	Date (Nov.)	Time (GMT)	Longitude of Eq. Crossing °W
4775	1	0008.7	49.8
4788	2	0103.6	63.5
4800	3	0003.5	48.5
4813	4	0058.5	62.2
4826	5	0153.4	76.0
4838	6	0053.3	61.0
4851	7	0148.3	74.7
4863	8	0048.2	59.7
4876	9	0143.1	73.4
4888	10	0043.1	58.4
4901	11	0138.0	72.1
4913	12	0037.9	57.1
4926	13	0132.9	70.9
4938	14	0032.8	55.8
4951	15	0127.7	69.6
4963	16	0027.7	54.6
4976	17	0122.6	68.3
4988	18	0022.5	53.3
5001	19	0117.4	67.0
5013	20	0017.4	52.0
5026	21	0112.3	65.7
5038	22	0012.2	50.7
5051	23	0107.2	64.4
5063	24	0007.1	49.4
5076	25	0102.0	63.2
5088	26	0002.0	48.1
5101	27	0056.9	61.9
5114	28	0151.8	75.6
5126	29	0051.8	60.6
5139	30	0146.7	74.3

ANSWER TO LAST MONTH'S CRYPTOGRAM

Secret message from kindly editor: Shape up or else! Tell the damned FCC what you think re proposed regs.

Joe Kasser G3ZCZ
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Silver Spring MD 20910

Have you heard or worked those ubiquitous Italian stations on 20 meters lately? What do you think of those stations who proceed to spell out their name, which is ten letters long, phonetically, twice or three times, and then the name of their town, which has twenty letters and then say "seventy threes"?

Do you realize that they are holding the QSO in what is to them a foreign language? Could you do the same, say hold a QSO in Italian or Spanish.

Italy has a very competent amateur radio set up. The national club is called the Associazione Radiotecnica Italiana, and they put out a very fine monthly magazine called Radio Rivista. The magazine contains a number of original technical articles as well as the occasional translated one from Radio Communication or from QST. It is full of advertisements for Yaesu, Drake, Gladding, Standard, Ten-Tec, Clegg and locally built equipment. Rigs are available for both FM and SSB on two meters, a band that is planned for mode sharing, with calling frequencies, RTTY frequencies and FM channels. The Clegg FM-27B is also sold covering the range of 144-146MHz. The published address of the ARI is: Via Domenico Scarlatti 31, 20124 Milano, Italy. Tel 203192.

Although Italy does not yet have a reciprocal agreement with the USA, it does have one with the countries comprising the European Common Market. So if you get a permit from one of these countries you may be able to get an Italian permit using one of your other reciprocal permits. It's not so complicated as it sounds, for there is an ON8. ./W on the air from the USA, and ON8 is the "call are" allocated to foreign residents or visitors under the reciprocal agreements with Belgium. It must be explained though that this ON8 is a native of Belgium but received his first ham license in France and was subsequently issued with an ON8 call. I've also heard a WN call signing Portable From South America on twenty meter phone, so strange things happen in the world of overseas operations.

For those intending to visit Italy on the most useful two meter frequencies are the calling channel on 145.5MHz and the International calling Channel on 145.55MHz. There is also an SSB calling channel on 144.2MHz. There is a lot of activity on SSB and in the summer, DX contacts can be made over the Mediterranean Sea. If you are taking a qrp hf rig, you might consider adding a qrp transverter module as described in vhf communications magazine. This unit would be advantageous in most European countries because a lot of mobile activity is on SSB using commercial equipment.

Does anybody read this column and if so what would you like it to cover? Reader response has been abismal lately and, if nobody reads this column then I might as well turn the space back to Wayne to fill with something of more interest to you readers.

. . . G3ZCZ/W3

Schley Cox WN9LHO
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Muncie IN 47305

WHAT DO YOU SAY?

At 0011 GMT the other night I called a WN8 in answer to his CQ. I didn't get a chance to give him his 479C signal report because he answered my call with a too lengthy preamble and then sent "QRM 73 CUL" and then signed off the air. At 0015 I logged an end to my shortest contact on record outside the Novice Roundup.

I know that sometimes we get on the air and the dinner call suddenly comes 30 minutes early or the envelope starts to melt on the final amplifier tube, but I have a suspicion that sometimes the super short contact is due to one or both operators having nothing to say.

Tradition has saved some new ops from mike fright by dictating that the RST, QTH and name be sent on the first transmission; the rig and antenna on the second; and finally, heart warming 73s and fervent CUL's on the third and last.

This is unfortunate unless there is a distinct need for brevity – e.g., contests, traffic or emergencies. There is a lot to talk about even at 5 wpm. I like to know something about who I am talking to on the air. How old is the other person, what does he (or she) do for a living, how many states has he

worked, does he build or buy, has he ever visited Indiana (or wherever I might be)?

One of the important things I like to hear from other ops is how my signal sounds. I have heard a few novices get into lengthy discussions about signal reports and maybe how one person's signals are not quite chirpy but that there is a definite frequency change during key down.

Some amateurs seem to be afraid to tell the other operator if they have a little chirp or click. There are some people on the air who either never work weak stations or they just can't bring themselves to give an honest 249 signal report.

Most novice ops have to depend on signal reports from other hams for any idea how their transmitter or antenna is performing. Sending an inflated signal report in hopes of avoiding embarrassment or insuring receipt of a much needed QSL card is a disservice to any operator.

If you feel like talking awhile you may have to ask some questions of the other guy before you get the conversation going. But if you do get a rag chew going remember to keep the transmissions short to make sure you are being copied.

There is very little reason for hit and run contacts on the novice bands. The ARRL suggests we refrain from talking about religion, politics or sex on the air. That leaves a pretty good selection of things we can and should be discussing.

Schley Cox WN9LHO

Guest Editorial

JERSEY SHORE
AMATEUR RADIO SOCIETY

Ye olde editorial staff was sitting around with a bunch of hams at the recent ARRL convention. We had been up and down the three "large" rooms of exhibits, and had sat in on one forum and part of a second. About halfway through the second forum, we started getting internal signal reports that it was time to refresh and restoke. Finding a nearby oasis, we cuddled around a Tequila Daisy and then noted that we were surrounded by several other hams intent on the same purpose. After nodding a time or two to establish our mutual relationship in amateur radio, we gave a password which joined us all into a small congenial group, "Hi there, can I buy you a drink?" Several Tequila Daisies later, we were all well introduced and seemed to represent not only the W2 area, but also several W3's, W4's and one W6.

Discussions began with reaction to the convention. It must be reported that aside from two of the fellows who were involved in part of the convention activity as participants, the overall reaction was one of disappointment. "Oh, it's great to eyeball so many of your old contacts" but it would appear that the facilities were not particularly geared to what one might expect of a convention which was billed as being national in concept. Great expectations regarding what the major manufacturers were going to unveil during this gathering were dashed as one traveled through the exhibition rooms. Oh there were a few presentations, but the absence of companies such as Drake and Heath were apparent. One could purchase touch tone pads and bargain LEDs (shades of our local flea market). The fellow cutting callsign badges had a waiting line, even the opportunity to guess how many pieces of junk (including used cigar butts) were contained in a bottle for a prize seemed to draw a crowd seeking fulfillment of their original expectations. A stranger to the hobby could easily wonder at the limited amount of emphasis placed on other than 2 meter FM.

Another point which met with accumulated nods of our assembled group was that several of the forums and seminars did an excellent job in presenting programs geared towards specific interests. One of the W3's noted, however, that in his opinion, some of the interest areas were so esoteric that the average ham who enjoys amateur radio as an outside hobby might find himself as lost as a high school youngster sitting in on a graduate class. This thought was picked up by tbe W6 who advised that he had sat in with the W3, and although he had professional background in the field, he found the choice of interesting groups was rather limited. The ad hoc group agreed that more choice on the part of the general membership to suggest seminars and forums might have engendered specific areas to be presented which would have more realistically represented the broad spectrum and level of ham interests. The W6 suggested that it was the responsibility of the member to rise to the level of the presentation or he really couldn't consider being a "real" amateur. (The fact that he had ceased to spring for any more rounds was not lost upon the group, and so they gave this arrogance the sneer that it deserved.)

About this time, our group was graced with the presence of a rather fetching YL who soon introduced herself as a fellow ham from W4 land. Sharing from our beaker of Daisies, she also shared a personal view with us. It seems that although she has been in amateur radio for quite a few years and holds a respectable advanced license, her status in the fraternity is generally relegated to a subservient level of something classified as "XYL or YL." "Good grief" she exclaimed, "I can handle a key, mike or soldering iron as well as most other hams (the Tech's and Conditional's in the group seemed somewhat nervous). Why do the various groups seem to consider us as people who make sandwiches while ham activity takes place? Why do they always seem to think that they must advise that YL activities are available? In point of fact, why do they set up YL groups and nets which definitely create a difference in the minds of many as to the ability of female amateurs? An amateur is an amateur. No wonder so few XYL's take an active interest in what seems to be a male-oriented activity.

"We feel as if we are trespassing into the 'MEN'S ROOM!" (Noting the number of Daisies she had consumed in this short time, we can attest that she would fit right into many of the radio club meetings we know of.)

Well, it seemed time to return to the convention room and so we set on and said our 73's to the group. Our discussion had turned to what several of the members termed, "the attitude of apathy within the radio fraternity" and we felt that this was discussion for another day. We admit to thinking how sad their home clubs must seem if they were beset with this problem of membership apathy — and we bethought of how lucky we were in our own JSARS club. So we merely smiled and walked out — warmed by the thought of the upcoming annual club picnic.

The KaChunker WR2ABR

Book Review

WORKING 1600 METERS

W2IMB has a little book out on QRP use of the 160-190 kHz band. This is NOT a hamband, but one open (with some restrictions) to anyone who wants to experiment with it. The book discusses antennas, circuits, DX that has been worked, sked times, etc. Send $1.75 for the book to Ken Cornell, Box 721, Westfield NJ 07091.

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

WB4OSN says August brought a number of openings but nothing very spectacular. Joe worked the Northeast, plus a few 8's, 9's and Ø's and heard the TI2NA beacon a few times. The WBØELN QSL finally arrived in Margate, Florida making 48 confirmed for Joe. . .congratulations are due! The final comment is a sad one, other KZ5's report that Don KZ5OO has left the Canal Zone.

John WA2UON says he has been reading this column for some months and has recently gotten active on the band. John lives in Castleton-on-Hudson, New York and is interested in contacting a club in the Eastern New York area. Anyone with information is invited to contact John at 1216 Maple Hill Road. . .the ZIP is 12033.

Seven contacts in six new states isn't a bad evenings work. That is the record according to Nick WA4ZDP of Jacksonville, Florida (wife Diane is WA4ZDQ). Nick worked Vermont, Connecticut, Ohio and four other states during an opening July 25th. Stations were heard as high as 50.200 and as low as the bottom of the phone band. The equipment consists of an FT-101B, FTV650 transverter, five elements at 60 feet with a Spectronics DD-1 digital readout as frosting on the cake. Commenting on other local activity, Nick says "Big Al" WA4HLP worked VE, KP4 and 30 states in one month.

SMIRK has passed the 500 member mark and shows no sign of stopping there. It is very encouraging to note the amount of activity generated by a relatively new organization founded by a relatively small group. This group has promoted 50MHz operation to a greater extent than anything since the Sunspot peak of the late 50's. More power to them and others working along side to generate the interest and activity the band so sorely needs. I for one would very much like to see a close association between the major Six Meter organizations, SMIRK, S.P.E.S.M., and the SIX-SIX Club, Inc plus the numerous smaller groups in order to further increase activity, work for RFI legislation, persuade manufacturers to design and produce equipment, and represent the 50MHz fan in FCC matters.

As an example, would it not be worthwhile to petition the FCC to allow phone in the 50.0-50.1 band segment? I cannot recall having ever heard more than a half dozen stations on CW in this 100kHz, even during the widest of openings. What little CW there is normally finds its way into the phone segment (or should I say Technician segment). Obviously the lower the frequency the more common the openings and the longer they last. Why should the vast majority be denied for the benefit of the few? Incentive you say? NONSENSE! If the desire were to upgrade the quality of the operator the proper way to go about it would be to dangle something he wants. My proposal is this.

1. Open 50.0-50.01 to all classes, CW ONLY. The space available would then be in keeping with the number involved.

2. Open 50.01-50.1 to PHONE, General and above. There would then be valid reason for the thousands of Technician Class licensees to improve their lot by upgrading.

I frankly have reservations in proposing the above. I have never felt that the good of amateur radio was served by setting off "lower" class operators to themselves. I know of no other activity which segregates the master from the apprentice. The archer, the bowler, the ball player all play on the same field and learn from the more experienced. If we must be divided, let us do it in some reasonable manner. . . .WAØABI

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you need help, let 73 know — don't be bashful — the readers are solid gold and are anxious to help you. If you would like to help, let 73 know about that plus your area of expertise, if any, so we can list you for either general help or as a technical advisor.

The following need some help — can *you* spare some time? Clubs in particular take note.

Authur L. Avillo, 5848 Garden Avenue, Marysville CA 95401.

Alan Kline, 30 King Street, Lynn, Mass. (ph 617 595-0873).

Leonard E Booth, 3123 South 13th, Niles MI 49120. (ph 684-3578).

W. Kenneth Lidman, c/o Walter Lidman, 12 Irwin Place, Hazlet NY 07730. (ph 201 26405371).

W. J. Elperin WNØLDN, 936 Curran Avenue, Kirkwood MO 63122.

SOCIAL EVENTS

SAN DIEGO NOV 1–3

ARRL SW Division convention — Town and Country Hotel — talk in 34-94, 3900, 7250. $5.50 registration, $9.75 banquet. Write Box 82297, San Diego CA 92138 for info and pre-registration details.

MANILA NOV 8 & 9

South East Asian Net Convention. For info write DU1JO, P.O. Box 386 MCC, Makati, Philipines.

CANTON – NOV 22

Massillon ARC Annual Flea Market and Auction. Send card for map and details: Marc, Box 8711, Canton OH 44711.

DELAWARE QSO PARTY NOV 30

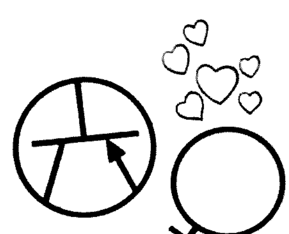
Starts 0001z Sat. Nov. 30 and runs for 24 hours. Good news for ops still needing Deleware on some band. Try 3560 7060 14060 28160 or 3975 7275 14325 21425 28650 or (Novices) 3710 7120 21120 28160. 5 pts per Deleware station, 3 for two counties worked or 5 for all three counties. Send logs to K3YHR.

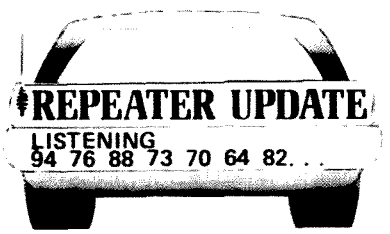
FORT WAYNE, IND–JAN 19

The Fort Wayne Hamfest is January 19, 1975 at Shiloh Hall (½ mile west of Ind. 3 on Carroll Rd.). Flea market, food. Tickets are $1.50 at the door. XYLs and children under 12 years free. Tables available at $1.00 for 4 ft. Talk in on 28 — 88 and 16 — 76.

STOUGHTON, MASS. NOV 10

HUGE AUCTION. The Minuteman Repeater Assn., a club with more than 300 members, will hold an auction with tons of good equipment on Sunday, Nov. 10, starting at 1PM, at the Stoughton High School. Bring your own goodies to be auctioned if you wish (club takes 10% of selling price). Snack bar, refreshments. For info call Maurice Finer K1GGP, Milton MA 617-698-7198.





Revision of Recently Published Repeater Atlas

NEW MEXICO

WR5ABH	Albuquerque	6.91-6.31
WA5VKY	Albuquerque	6.13-7.06
WR5ABV	Capitan	6.34-6.94
WR5ABU	Los Alamos	6.28-6.88
WR5ACE	San Antonio	6.16-6.76
WR5ACM	Mt. Taylor	6.34-6.94

NEW YORK

WR2AOM	Bellmore	6.25-6.85
WR2ABU	Boston	6.31-6.91
WR2ADR	Buffalo	6.13-6.73
WR2ACM	Dunkirk	6.25-6.85
WR2ABL	Elmira	6.10-6.70
WR2	Hunter	6.28-6.88
		444.55-449.55
		223.38-224.98
WR2ABD	Ithica	6.37-6.97
WR2ABW	Larchmont	CLOSED
WR2AOZ	Long Island	7.973-7.375
WR2ABA	Long Island	52.64-52.525
		7.81-7.21
WA2KSB	Long Island	6.10-6.70
WR2ACW	Long Island	6.145-6.743
W2DQI	Long Island	6.22-6.82
		6.58-6.82
WR2ACG	Long Island	7.085-7.685
WR2	Long Island	7.73-7.13
WR2ACH	New York City	6.28-6.88
WR2ACD	New York City	7.69-7.09
W2JUP	New York City	7.87-7.27
WR2ABK	New York City	7.915-7.315
WR2	New York City	444.55-449.55
WR2	New York City	223.26-224.86
		444.70-449.70
K2QGT	New York City	449.30-444.20
WR2AAA	Manhattan	442.05-447.05
		7.73-6.73
WR2ACD	Manhattan	6.40-7.00
		449.30-444.30
WR2	Norwich	6.07-6.67
WR2ACT	Olean	6.25-6.85
		6.34-6.94
WR2ADF	Oswego	6.25-6.85
WR2ADC	Pearl River	7.72-7.12
WA2UWQ	Rochester	6.28-6.88
WR2ADW	Rome	6.34-6.94
WR2ADN	Saratoga	6.40-7.00
		445.50-147.00
WR2ABV	Schenectady	6.46-7.06
WA2RJX	Syracuse	6.04-6.64
WR2ACL	Troy	6.34-6.94
WR2AOW	Utica-Rome	444.2-449.2
		6.34-6.94
WR2ACR	Watertown	6.10-6.70
WR2	Watertown	6.16-6.76
WR2ACN	Woodmere	6.04-6.64
WR2ABW	Yonkers	6.31-6.91

NORTH CAROLINA

WR4AEV	Asheville	6.16-6.76
		222.34-223.94
WR4AGF	Asheville	6.22-6.82
WR4	Asheville	6.31-6.91
WR4	Burlington	6.07-6.67
WR4AGC	Durham	6.22-6.82
WB4QFT	Durham	449.10-444.10
WR4ADT	High Point	6.40-7.00
		447.90-442.90
WR4AFV	High Point	6.19-6.79
WR4	Laurinburg	6.07-6.67
WR4ABX	Lexington	6.31-6.91
		222.30-223.90
		443.31-448.91
WR4	Manteo	6.34-6.94

NORTH DAKOTA

WRØACJ	Bismark	6.34-6.94
WRØADQ	Fargo	6.16-6.76

OHIO

WB8CXO	Akron	7.69-7.09
WR8ACI	Athens	6.34-6.94
UC	Canton	6.19-6.79
WR8	Central Ohio	6.46-6.06
WR8ACB	Cincinnati	6.115-6.70
WR8ACC	Cincinnati	7.99-7.39
WR8	Cincinnati	448.90-443.90
WR8ACP	Cleveland	53.15-52.79
WR8ABL	Cleveland	53.25-52.60
WB8APD	Cleveland	52.92-52.68
WA8CEW	Cleveland	52.96-52.72
WB8CRV	Cleveland	6.28-6.88
WB8CRP	Cleveland	6.22-6.82
WR8ABC	Cleveland	6.16-6.76
		6.355-6.76
		449.95-447.95
WA8BBN	Cleveland	6.25-6.85
W8WV	Cleveland	6.115-6.715
W8TQA	Columbus	52.76-52.525
WR8ABV	Columbus	6.16-6.76
WR8ABR	Columbus	6.31-6.91
WR8ACA	Columbus	7.81-7.21
WR8ABR	Columbus	6.37-6.97
WR8ACV	Dayton	6.04-6.64
WA8PIA	Dayton	443.75-448.75
UC	Freemont	6.31-6.91
WR8ABW	Galion	6.25-6.85
WR8ACU	Hudson	6.01-6.61
WR8ACM	Marietta	6.28-6.88
UC	McConnelsville	6.22-6.82
WH8	Millersburg	6.07-6.67
WR8ABS	Monroe	6.01-6.61
WR8ABX	Newark	6.28-6.88
WR8ABJ	Newcomerstown	6.13-6.73
		6.325-6.73
K8JHG	Ottawa	W1.8 6.28-6.88
		52.76-52.525
WR8ADC	Toledo	6.01-6.61
WR8ACT	Toledo	6.34-6.94
		6.19-6.79
WR8ABU	Vandalia	6.25-6.85
WR8ACZ	Vandalia	442.85-447.85
K8NPY	Willowick	53.70-53.46

OKLAHOMA

WR5ADO	Bartlesville	6.16-6.76
WR5	Elk City	6.16-6.76
WR5	Lawton	6.34-6.94
WR5	Norman	6.28-6.88
WR5ADE	Oklahoma City	6.34-6.94
WR5ADD	Ponca City	6.37-6.97
WR5	Still Water	6.13-6.73

OREGON

W7DBS	Eugene	T1.8 6.10-6.70
K7TBL	Eugene	6.16-6.76
W7DFY	Grants Pass	6.34-6.94
WR7ADC	Klamath Valley	6.01-6.61
WR7ABK	Medford	6.34-6.94
WR7ADD	Philomath	6.22-6.82
WA7CHL	Portland	6.10-6.70
		444.45-445.45
WR7ABE	Portland	444.17-449.17
		6.34-6.94
WR7ADI	Portland	6.40-7.00

PENNSYLVANIA

WR3ACM	Altoona	6.22-6.82
WR3AAA	Freedom	6.25-6.85
WR3AAB	Lehigh Valley	6.10-6.70
WR3ABR	Mt. Holly Springs	6.28-6.88
WR3ADB	Munct	6.22-6.82
WR3ACE	New Holland	6.01-6.61
		223.34-224.94
		444.15-444.15
WA3BKD	Philadelphia	6.16-6.76
WR3ABE	Philadelphia	52.76-52.64
		448.80-443.80
WR3ABK	Philadelphia	6.37-6.97
WR3ACK	Reading	52.575-52.680
WR3ACU	Philadelphia	52.82-52.38
WR3	Philadelphia	7.63-7.03
WR3ABZ	Philadelphia	7.66-7.06
WR3ABX	Philadelphia	223.34-224.94
WR3ACI	Pine Grove	6.04-6.64

TEXAS

WB5AEI	Alice	444.10-449.10
W5CBT	Amarillo	6.34-6.94
		444.50-449.50
WR5ACO	Arlington	6.07-6.67
WR5	Arlington	7.75-7.15
WR5	Arlington	449.20-444.20
WA5YUD	Austin	449.10-444.10
WR5ACS	Beaumont	6.16-6.76
K5FPJ	Beeville	6.34-6.94
WR5ACI	Big Spring	6.22-6.82
WR5AEA	College Stn.	6.22-6.82
WR5ACO	Corpus Christi	6.34-6.94
WR5ACT	Corpus Christi	6.22-6.82
WA5YVK	Corpus Christi	6.28-6.88
WR5ABE	Dallas	6.13-6.73
WR5ABY	Dallas	6.28-6.88
WA5VKV	Dallas	449.00-444.00
K5IQP	Denton	6.28-6.88
WA5YTL	Denton	6.31-6.91
K5ZCO	Dallas	6.25-6.85
WA5YTM	Ft. Worth	6.34-6.94
		6.16-6.76
		449.10-444.10
WA5YUM	Ft. Worth	53.16-52.56
WA5YVC	Ft. Worth	448.90-443.90
WR5ACW	Georgetown	6.16-6.76
WR5ABJ	Houston	6.07-6.67
W5KAB	Houston	6.10-6.70
K5IHK	Houston	6.13-6.73
WA5YUB	Houston	6.16-6.76
WA5YUJ	Houston	6.19-6.79
W5PMQ	Houston	6.25-6.85
WA5LJD	Houston	6.31-6.91
WR5ABX	Houston	6.34-6.94
WR5ABS	Killeen	6.34-6.94
WR5ACZ	Lubbock	6.34-6.94
WR5	McAllen	6.61-6.78
W5TJD	Mineral Wells	6.04-6.64
K5FPI	Mt. Pleasant	6.34-6.94
W5LUP	Odessa	6.34-6.94
WR5ACA	Plainview	6.22-6.82
		6.22-6.94
WA5RUQ	San Angelo	449.20-444.20
WR5ADH	San Antonio	52.880-52.525
		6.22-6.82
		6.34-6.94
WR5ACL	San Antonio	6.01-6.61
		6.28-6.88
WR5ABR	San Antonio	6.16-6.76
WR5ADJ	San Antonio	449.10-444.10
WR5ACK	San Benito	6.34-6.94
WA5ZUP	Temple	6.13-6.73
WR5ACP	Temple	6.22-6.82
WR5ABF	Texarkana	6.22-6.82
WA5YTN	Victoria	6.34-6.94
WR5ABK	Waco	6.28-6.88
WR5ABD	Wichita Falls	6.34-6.94

MORE NEXT MONTH

Send any and all corrections, updates or new listings to 73 Magazine, Peterborough NH 03458.

Amateur Radio

MCMLXXIV | Monthly Ham

THE NEXT VOICE YOU HEAR WILL BE. . .A HOOLIGAN

MOSCOW –Strange things can be heard crackling over the Soviet air waves these days – not from the hated foreign broadcast but from such stations as Radio Demon, The Diamond, Dragon, Ninochka, Black Soul, Sea Devil and Tempest.

They are all illegally operated inside the Soviet Union – mostly by young radio enthusiasts – and the government is taking ever more serious measures to stamp them out. However, with all of the modern electronic means of tracking down the private shortwave and ultrashortwave broadcasts, the authorities have found that as soon as one is silenced another pops up.

But the fact that the term applied to these illegal operators is "radio hooligans" indicates an even more serious official displeasure over the political jokes criticizing the regime, the distribution of information offending the government and the Communist Party, and the playing of rock music, which is regarded by the authorities as "degenerate" and "decadent bourgeois culture."

The above was reprinted from the Los Angeles Times and brought to our attention by Dave WB6ZGF.

STUDY OF LDE PHENOMENON

A startling new interpretation of the rarely observed phenomenon of "Long Delayed Echoes" is being researched by a small group of engineers at EMI's SE Computer Peripherals plant in Feltham, Middlesex, England.

The effect was first investigated by radio pioneers in the 1920s.

Led by Tony Lawton, SE's technical manager, the group is setting up an experiment to test an hypothesis by Scottish researcher, Duncan Lunan.

Lawton and his team are conducting the investigation in their own time, but with EMI's full backing. Even if they disprove Lunan's theory, they hope to shed light on a phenomenon that has puzzled scientists for decades.

The first reports of LDEs was published in a letter to *Nature* on November 3, 1928 by the ionospheric expert, the late Prof. Carl Stormer of Oslo. He and engineer Jorgen Hals observed LDEs on transmissions made by Dr. van der Pol using the Phillips experimental transmitter PCJJ at Eindhoven in Holland. The frequency used was 9.55 MHz with 15 kW into a long wire aerial.

Morse letter "S" was repeated at intervals of 30 seconds, and received almost instantaneously by Stormer and Hals. Also noticed was the fairly common one-seventh second echo effect as the signals circled the globe, but other distinct echoes were heard with intervals varying between 3 and 15 seconds.

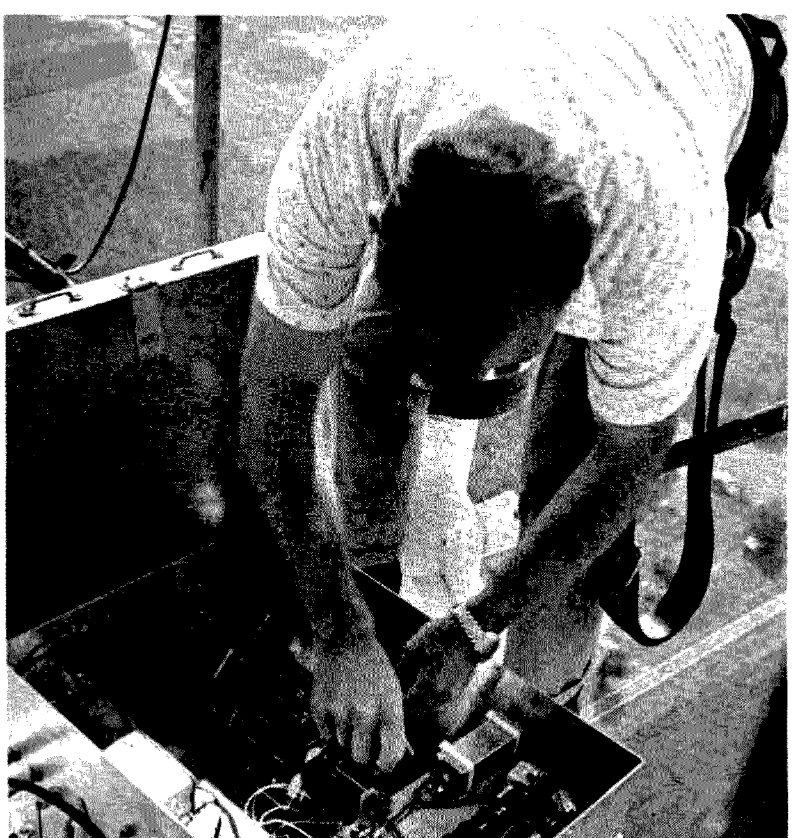
Two French workers, J.B. Galle and G. Talon observed LDEs in May 1929 using a 500 watt transmitter on a wavelength of 25 meters. A description of the very long sequence of echoes with delays between 1 and 30 seconds was published by Galle and "L'Onde Electrique" Vol. 9, 1930.

The key lies in the plotting of a simple graph for each echo sequence. The sequence of transmitted signals is plotted along the horizontal axis, while the delay of the echo (in seconds) is plotted on the vertical axis.

Stormer's sequence plotted in this way gives a pattern which Lunan points out bears a striking resemblance to the constellation Bootis.

The graphs for other sequences yield plots of many other recognizable stars and constellations.

Overall, the information, if such it is, decoded by Lunan is consistent with the hypothesis that LDEs are being returned by a space probe that arrived in the solar system from the star Bootis some 13,000 years ago to



Curt Powell, WB4WAA, makes an adjustment to the WR4ABP repeater located at 1300' on the WITN-TV tower at Grifton, N. C. The 146.16/76 FM repeater was first licensed in May 1972 as W4NBR and was constructed by F N C Repeater, Inc., an amateur club of 60 members residing throughout eastern North Carolina. The unit is radio controlled via 450 MHz from five control points. An elevator in the WITN-TV tower provides easy access for infrequent maintenance of the solid state repeater which now uses transmitter and receiver boards from a Standard 803 transceiver.

search for intelligent life, as manifested by radio transmissions.

Tony Lawton and his colleagues plan to put this to the test by beaming transmissions, probably using a high powered 144 MHz transmitter and a high gain aerial.

PEOPLE'S REPUBLIC OF CHINA

The People's Republic of China has acceded to the International Telecommunication Convention, 1965, but has made three statements including one to the effect that China makes reservations on the articles concerning the assignment and utilization of radio frequencies in the Radio Regulations. In other words there is still no regulatory backing for repeated requests for the removal of unwanted broadcast stations in the amateur exclusive band, 7 to 7.1 MHz.

The form of call signs to be issued by the Chinese administration to amateur stations is:

The letter B followed by a letter designating the geographical area followed by a single digit, and then followed by the letter A or A with one of two letters.

The letters designating the geographical areas are listed below:

F – Shensi, Honan
G – Nanking
H – Shanghai
I – Kiangsu, Chekiang, Anhwei
J – Hankow
K – Hupeh, Hunan, Kiangsi
L – Chungking, Szechwan, Sikang, Tibet
M – Yunnan, Kweichow
N – Kwangtung
O– Canton, Kwangsi, Fukien
P – Peiping, Tientsin
Q – Hopeh, Shantung, Shansi
R – Jeohl, Chahar, Sulyuan
S – Kansu, Ningsia, Chinghai
T – The nine northeastern Provinces
U – Sinkiang
V – Taiwan

FCC TASK FORCE HUNTS FOR HOME RADIO ABUSERS

No one knows when they'll hit town – it could be tomorrow. They move in under a cloak of secrecy and set themselves up in a lonely motel room or vacant office. They bring their equipment with them, the most sophisticated in electronics gear. Their cars are specially rigged with tracking devices. They have a van crammed with recorders, meters and detectors. The job takes about a week. They get what they need and move on to another town, another state.

These are not a band of super criminals setting up some slick caper. They come to town to track down the source of a common complaint from families throughout the nation – TV interference from home radio hobbyists. The FCC has recently reorganized and expanded a special task force division, setting up specialized 10-man enforcement teams assigned to "clean up" mounting abuses among operators of the popular "Citizens Band" radio rigs.

Reprinted from the Sunday Star-Ledger, Newark NJ.

WB1ETH

A Special Events Station, WB1ETH, was operated for the Bethlehem, NH Bicentennial the weekend of August 9, 10 and 11. Operators were Mike Blandin WA1RKH, Chris Hanson WA1SHO and Bob Daniels WA1ODG. The station transmitted approximately 35 radiograms, many being from passers-by to friends or relatives. We made approximately 90 contacts on 15, 20, 40 and 80 meters using a Ranger and an HW-101. Antennas were a 120' dipole and a 22' vertical. Those who contacted WB1ETH are requested to send a QSL and SASE to WA1RKH.

Mike Blandin WA1RKH
Box 25
Bethlehem NH 03574

RECIPROCAL LICENSING IN ISRAEL

Every radio amateur who presents a valid license from his own country can receive an Israeli license. At the time of government examinations, he will be questioned in those specific areas where it is felt that the technical level in his own country is lower than in Israel. Decisions regarding the technical levels will be based upon a comparison of the syllabus from the amateur's own country to the syllabus in Israel. An amateur who does not psss the examination, or decides not to sit for it, will automatically be issued an Israeli license that is one grade lower than his original license. Examinations are currently held in Israel twice a year during the school vacations of the holidays Passover and Rosh Hashana (the Jewish New Year).

In the case of the U.S., Canada, U.K. Austria and Costa Rica, special reciprocal licensing agreements exist. Amateurs from these countries may receive licenses during any period of their stay in Israel, and they are not required to sit for any examinations.

Amateurs who do not bring equipment can receive permission to operate every amateur station in Israel as second operators.

Further information, application forms for reciprocal licenses may be obtained from:

Ministry of Communications,
Engineering Services
Postbox 29107
Tel-Aviv, Israel

(from R. Kline 4X4NJ)

COUNCIL AVOIDS ROW WITH HAMS

Bell, California's City Council warded off a confrontation with irate ham and citizen band radio operators worrying that restrictive rules might be passed by the council (they were not considered).

The meeting started off with an overflow crowd of some 125 persons jamming the council chambers, most of them amateur radio operators alarmed over reports that city officials might consider requiring special permits as a way of controlling transmitters interfering with television and radio reception and even telephone communications.

But a threatened protest never developed because city officials heard a report from City Administrator John Pitts that he had contacted owners of offending transmitters and they had cooperated fully by adjusting their sets or dismantling overpowered transmission equipment.

The council heeded the administrator's recommendation to drop the matter, and was immediately treated to the rare sight of a packed house cheering their actions.

Courtesy of Leonard R. Fox WA6SXK

LETTERS

FM REBUTTAL

Re Al Chapman's (W6MEO) letter in the September issue of 73. The two meter FM "growing pains" here in the Southland are no different than most other large urban areas throughout the country. I can attest to this since I have had the opportunity to see the situation on both sides of the continent and a number of places in between; In most cases, one repeater, the one that combines the virtues of best area coverage with a minimal number of operating restrictions will become the congregating spot for the majority of operators. It will become the training ground for 9 out of every 10 newcomers to two meter FM. It was that way back in N.Y.C. on the old WA2SUR and is the same out here on a number of machines. No ham, whether he or she has been around amateur radio for more years than they wish to remember or is the newest of newcomers can be an "A-1 Op" the moment they enter the world of VHF-FM. Operating technique on a VHF repeater takes time and effort to learn in the same way one learns to be a champion DXer.

I must, however, take exception to Al's suggestion concerning types and duration of license. One cannot legislate a good operator into existance. A ham either wants the respect of his peers or he doesn't. It is not the class of license that one holds that makes him or her a good operator, but a sense of self respect. To carry this further, if a person has no respect for himself, then he will show little respect for others. The ham who will "step on you" on a two meter repeater is the same type of ham that will "step on you" while you are trying to get that "rare one" on 20 SSB. It's not the class of license that is at fault, but rather the personality traits of the operator.

Sure, many of our machines get plagued by "Kerrrchunker's," Jammers and poor operators. But a combination of peer pressure and the marvelous ability that we in amateur radio have to police ourselves usually works and those that are habitual offenders eventually change their ways or just "go away." If there is one shame to be found in this whole affair it is that in the process we sometimes also loose potentially fine members of the VHF-FM community due to the poor first impressions they may get. However, before you prejudge two meter FM and its associated repeaterized operation I suggest you think carefully about one of those "DX Pile-ups." In both cases you will find the "screwball" who has to spoil it for the rest of us. Remember, though, that we are hams because we love amateur radio and that there is a place in it for all of us regardless of what class we may hold. No band or mode is a utopia and each suffers in its own way. It is the obligation of all of us to build amateur radio from within if we are to survive.

Bill Pasternak WA2HVK/6
Associate Editor-Looking West

THANKS, STEVE WA1DFL

While reading the September 74 issue of 73, I noticed a letter from a ham whose call was very familiar. I refer to Steve Rich WA1DFL from Revere, Massachusetts.

I was a patient at Chelsea Naval Hospital in 1966 like a lot of other Viet Nam veterans. My dad brought my PC62B to the hospital for me to use to help pass the time. This is where I met Steve.

Steve became very friendly with us at the hospital. He began running phone patches and messages for the guys making them very happy. I'm sure I speak for all the guys when I say thanks Steve for making our stay enjoyable!

Ron Pariseau K1VSC

RECEIVER PROJECT WANTED

Your questionaire in the back of the just received 73 prompts me to write. Yes, there is definitely something I'd like to see in the way of a construction article.

Remember the old 6L6-807 ARRL rig? Everybody built one. . .at least it seemed that way back in 1946 when I first got my ticket. . .now nobody builds unless it's a Heathkit.

What I'd like to see in the way of a construction article would be a receiver. . .from 80 through 10 meters. . .using standard and readily available parts, straightforward circuitry and transistors where possible. I'd like to see this in the light of a re-birth of the home-built station where you can build something that is at least capable of keeping up with what is offered built up commercially, then possibly later, a matching transmitter. AM, CW and SSB, of course.

I am not capable of designing such a rig and I've written to OST every so often over the last quarter century and got nothing. Most responses are "design it yourself and submit it and we'll print it". Hmmm. . .nobody likes a smartass and so it goes, the good basic ham receiver you can build yourself is yet to be offered. Sure there is the specialized CW or SSB receiver either for a single band or one some engineer whipped up with exotic components or a squirrily circuit nobody could get to work. There must be someone in your vast circle of acquaintances in the ham world that can give us "The 73 Basic Receiver – you can build it yourself."

Oh, yes, how did you get the apple to move so fast and the bullet to stand still for the apple to pass through the bullet. . .at least that's the caption on the apple/bullet photo – OK so everybody makes a mistake.

Best to you and keep up the fine magazine.

. . .W4KFK

A GREAT AMPLIFIER

Wayne, I want to tell you about a great company that I read about in 73. I ordered a 2-meter 15 watt amplifier from VHF Engineering. It is well engineered and easy to build. I tested it and found it very stable and easy to tune up and broad band.

I drive the amp with a TR-22 measuring the power output with a Bird wattmeter from the front seat of my car – 20 watts out. Then I started my car engine – 26 watts out with a 5/8λ whip on the rear deck and 52 watts ERP.

Now that's a product that gives you your moneys worth.

Keep up the best magazine there is!

Robert A. Daffer, Jr. WBØFUR
3016 Bristol Court
Blue Springs MO 64015

COMTEC?

The communications technologies described by G. J. Hanneman (September, 1974) are exciting. The sad part is that we hams remain largely unaware of what lies around the next bend in the wire. Communications is what ham radio is all about. Yet we tend to think entirely in terms of ham radio (the far past) plus a little new stuff when the related ICs become available from the surplus dealers (the near past).

Hanneman has offered to write a couple of articles on the state of the art. By all means, let him bring us up to date. But don't stop there – 73 should keep us up to date with regular articles or even a column on communications technologies.

William W. Creitz K3TJC
Columbia MD

NOSTALGIA

And to think when I first subscribed you were selling lifetime subs for $25. Keep your head above water, we need you.

WA2MGA

WARNING

Fig. 4 of the 3000 volt power supply article in the July issue has a note that says to connect the neutral of the 220 volt (3 wire) line to the transformer if operating two 110 volt primaries in series.

This is very bad business, because if one of the line fuses blows you won't know it. A very slight drop in high voltage output results that is easily passed off as line voltage fluctuation, or is overlooked entirely. The primary with the fuse that didn't blow takes the entire load, and will overheat and burn out if operation is protracted or if the transformer is not greatly oversize.

The reason for this is that the transformer primary connected to the fuse that blew begins to act as a 110 volt secondary winding, excited from the other 110 volt primary that is still energized by the good fuse. If the upper fuse on the diagram blows, the fan will still operate and the bulb lights. If the bottom fuse blows, the relay still works.

One fuse blowing (normally only one will blow in case of momentary overload, or just old age sometimes) is an extreme case. In the meantime, differences in voltage between the two 110 volt sides, and they are never exactly the same, will cause differences in load sharing between the two primaries.

It is best not to make this connection. It is best to treat the two 110 volt windings in series the same as if they were one continuous 220 volt winding. Indeed, that's what they are, as far as the transformer operation is concerned. It's like having a 220 volt winding with a 110 volt tap, when the two primary ends (one start end, one finish end) are connected together, with the tap unused.

When the transformer is used on 110 volts, the two primaries are connected in parallel, and both share the load equally if the connections are made properly. They are treated like a single heavy winding and never individually fused. Similarly in series, the only way to ensure equal load sharing is to leave the "center-tap" unconnected to neutral, so that in effect one continuous 220 volt winding is active.

Ted Chernin KH6GI

TEETH GIVE FEEDBACK

It was one of those cases, my 90 day guarantee was in its last couple of weeks. One morning I was talking on my handheld 2m unit when, "Hey you have a sick radio there old man, you have feedback on your signal!" Well, the next day I went back to where I bought the unit to get it repaired. A day later it was back and there was that feedback again! I took it over to a friend's house and we talked over it with no feedback. I took a transmission – bang – there was the feedback. He placed his car keys near the mike and there was the feedback. Next we tried it with my partial dental plate out and no feedback. I put a 150pF silver mica from each side of the mike to *ground* and this cleared up the problem. Now I can wear my teeth and talk at the same time.

J.W. Greelak
Ontario CA 91762

MONO-REPRODUCER IMPROVEMENTS

Having built the Nono-Reproducer (K9VXZ Sept 74, 73 Magazine) I would like to pass along some improvements I made while experimenting with the unit.

I changed C1 to .01 from .05 to improve the high frequency response. The entire assembly was built in a Pamona box with BNC plug and jack already mounted (available from Gateway Electronics, St. Louis) for ease in connecting and disconnecting the unit, a feature valuable in demonstrations. All parts were mounted on a PC board to conserve space and improve the appearance of the unit. For line (1) in the original figure I used a piece of RG-17U coaxial cable, which I had in the junkbox, to improve the RF characteristics and to eliminate stray capacitance. This should, of course, be as short as practible.

I am now working on a Stereo Reproducer, utilizing the same design, while trying to retain the valuable foolproof features incorporated.

Michael R. Hanna K8UUO

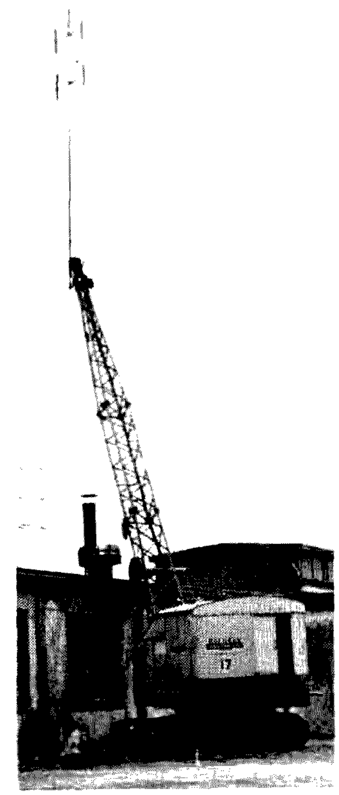
GREEN SUPPORTER

I've just heard the news and I'm horrified. Guess this is "old hat" to you and much could have happened since the original verdict was promulgated. . .I hope it has and I'm sure the "gang" is rallying round to give you support. Just what form this might take is difficult for me to imagine from this part of the world but I want you to know that I'm a Wayne Green supporter and if there is a call for some monetary aid, then I'll be a supporter again.

I realize too that you gave NZART some real help last year because of my request – just another aspect of your efforts in support of amateur radio in general. So – old friend – keep on keeping on. In spite of all, ever so many folks are very appreciative of your efforts over the years and I'm sure will expect you and "73" to continue to flourish in the future.

Good cheer to you and kindest to the family.

Jock White ZL2GX



ANTENNA

Enclosed is a photograph of, I think, a rather unique VHF antenna installation that I happened to come across recently. Possibly you will be able to use this photo in some future issue of 73 Magazine. Hope you can use it.

Pete Walton VE3FEZ

BACK ISSUES

I received the 36 issues of 73 which I ordered from the Book 'n Stuff portion of your magazine. I would like to say that it was one of the most enlightning deals I ever got. Just skimming through them brought back memories of circuits that were tried and, due to my ignorance, failed.

Most of them were from my "pre-FM" days and, having been almost exclusively FM for the last few years, I really got an education in the old tube circuits. Currently, there are plans afoot to put squelch in a converted AM rig (December '60 page 26) as the highly modified circuit I "stole" from a military receiver ain't so hot.

Again, many thanks for offering this fine selection. At 33¢ a copy, I kind of felt guilty about ripping you off. The other books I ordered were also quite interesting, especially the *VHF Projects for Amateur and Experimenter.*"

TNX es BCNU on VHF/UHF FM es CW.

Carl Hattan KØBZV/KL7

More LETTERS *on page 144.*

QSL CONTEST

We have two winners this month. WB9HPT has not only designed a card which really stands out on a wall but by including illustrations of his other interests,he lets his contacts know more about himself. We have included the note which our co-winner, WA9FTH, sent along with his card. He receives a free one year sub as well as WB9HPT, proving that it pays to blow your own horn. If you think your QSL is something special, send it to 73, QSL Contest, Peterborough, NH 03458. You could win a one year subscription.

WINNING CARD

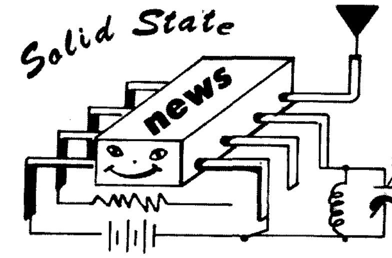
Enclosed you will find the winning entry for your QSL design contest. I am sure you will notice that this card design is striking and beautiful. I am almost ashamed to turn this beautiful card into your contest as it is so obviously superior to any other card in the world.

... WA9FTH

Mfr., Model, Ser. No.	Owner	Issue
Clegg 27B No. 72013-1068	W3BXL	7/73
STD. 826 MA No 208078	WB2DEW	7/73
Drake ML-2 No 10582	W3MSN	8/73
Sonar FR-2528 No. 21-4250	Doherty	12/73
STD SRC-851-SH		
No. 9725		
STD SRC-707C		
No. 2833		
TPL PA-6-IDE No. 1092		
RP MEA-22 No. 212		
Two Larsen Antennas		
Swan 270 No. M-252616	W4NTB	12/73
STD SRC-146A		
No. 208070	W7DKB	12/73
Marker Luxury	W7BVP/6	2/74
No 2296		
Regency HR-2A 2m FM	WB8NSU	3/74
No. 04-05632		
Collins Model KWM-2	W9JS	3/74
No. 13551		
Regency HR-2A	WA3TVI	4/74
No. 04-0787		
Kenwood TS-520	W7JFR	5/74
No. 840092		
CW-520/511S filter		
Inoue EC-20 No 1161	W1PVF	7/74
1-RF Communications		
RF-403-2 VHF-FM XCUR		
No. 1277	K3YHR	7/74
Sonar 3601 No 1416	K1UXD	7/74
SBE Model SB-144		
No. 46316 S25 reward		
S25 for information for arrest		
and conviction of thief.	K4KVF/5	7/74

The Hamburglar
STRIKES AGAIN!

Mfr., Model, Ser. No.	Owner	Issue
Clegg 27B No. 27103-2891	WA1ECF	7/74
Clegg 27B No. 27104-3498	W9VHD	11/74
Drake TR3 No. 12746A	W9VHD	11/74
Collins 30L1 No. 29625	W9VHD	11/74
Drake TR22 No. 620272	K3NCL	11/74
VHF Eng. 1501 amp	K3NCL	11/74
Std. 826M No. 203085	WA9VNW	11/74
Motorola Motran VHF Trans		
Serial No. DG153W	Contact 73	11/74
SBE SB-144 2m FM Trans		
Serial No. 720087	WA3IID	11/74
Varitronics HT-2, 146.97MHz		
Serial No. 640256	K3ZPH	11/74
Unimetrics Ultracom-25		
Serial No. 090561	VE7AZG	11/74



Walter Scott K8DIZ
7318 Hollywood Drive
West Chester OH 45069

Thanks to the response of several of you readers, I have been selected to provide you with a monthly update on the world of solid state electronics. While I may have my ideas as to what types of circuits and devices you are interested in hearing about, I would greatly appreciate a short note, or even a QSL card, listing your solid state and experimenting interests. With your help we can make the best use of this space each month.

A growing number of hams are becoming interested in tone control circuits: repeater access control, Touch Tone signaling for auto-patch systems, tone keyed squelch, and remote control of whatever needs to be controlled.

Microsystems International has developed a series of telecommunication products using monolithic linear and digital ICs together with Tantalum thin and thick film technologies. Of particular interest is the MH8900 series of tone generators. This unit requires double pole Touch-Tone type switches in its keying circuit. It generates the standard tone dialing frequencies of 697, 770, 852, 941 Hz (low group) and 1209, 1336, 1477, 1633 Hz (high group). Supply voltage can be between 4.5 and 35 VDC. Current requirements are from 7 to 12mA depending on supply voltage. Typical rise time to a specified output frequency even when Vcc is switched — 5ms max. The tone generator is constructed in hybrid form using silicon ICs and the Tantalum thin-film process developed by Micro-systems. The circuit comprises unique, dual, high gain amplifiers with a bias and clipping network, coupled to modified parallel T filters. All capacitors and all but four resistors are fabricated using Tantalum thin-film resulting in a high degree of frequency stability and close tolerance. The resistors in each IC are precisely adjusted, with the circuit operating, by burning away resistance material with a laser! Worst case frequency drift of this IC is less than 1.5% when considering the effects of the temperature coefficients of the passive components, amplifier pulling, long term drift for the full lifetime (greater than 15 years), and varying supply voltages.

The MH8913J is being offered for sale by KA Electronics Sales (1220 Majesty Drive, Dallas TX 75247), including data and application sheets for $18.00 (see Sept. 73, pg. 153). Further info on this series of ICs can be obtained from Microsystems International Ltd., Marketing Mgr. — Telecom Products, Box 3529 Sta. C, Ottawa, Canada K1Y 4J1.

Other manufacturers are interested in the telecommunication market. Motorola will soon have available a CMOS version of a Touch Tone generator. The low power requirement should make this a winner. A CMOS Touch Tone receiver should be available in the not too distant future. More on these as info becomes available.

In those areas where Touch Tone service is not yet available on the land line circuits, some additional circuitry is necessary to interface your tone signals with the phone line for remote control or auto patch use. General Instruments has introduced a telephone dialer circuit which could perform the dialing into a pulsed dialing phone system. The AY-5-9100 is primarily intended for providing a way to use a push-button phone with a dial pulse only system. In a radio system a Touch Tone receiver could take the place of the push-button dial or keyboard. The transmission path would be something like this: FM transmitter modulated with tones — FM receiver demodulates tones — tones fed to a Touch Tone decoder — decoder drives AY-5-9100—AY-5-9100 drives transistor and dialing relay. The Touch Tone decoder could be constructed of seven 567 PLL tone decoders and some logic gates.

The AY-5-9100 contains four storage registers to store the dialed number in BCD format either in total or partially depending upon the difference between the dial in and dial out speeds. Pulse repetition rate, inter-digital pause, and mark-space ratio are all programmable. Outputs are provided for line pulsing and muting. An input inhibit is provided to allow storage of one number of up to 20 digits. This allows the original dialed number to be redialed just by providing one command signal rather than repeating the dialing procedure. The IC operates from -15VDC and only requires 2 milliwatts of power. This is a PMOS IC available in an 18 pin DIP. It is available in single quantities for $20.00 from General Instruments Corporation, Microelectronics Div., 600 W. John Street, Hicksville, New York 11802. This is quite a sophisticated IC!

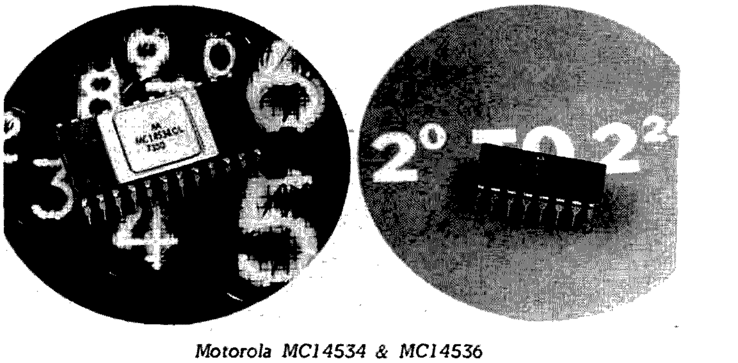
TIMERS AND COUNTERS

A flexible 24-stage ripple binary counter, and a real time 5-decade counter have been introduced by Motorola. Capable of counting from 1 to 2^{24}, the MC14536CP PROGRAMMABLE TIMER consists of 24 counters with the last 16 stages selectable by a four-bit select code. Real time event counting can be accomplished with the MC 14534CL FIVE DECADE COUNTER in continually update multiplexed displays.

By varying the input clock frequency of the MC14536CP Timer a wide variety of timing intervals can be achieved. Using a four-bit binary select code the output intervals can also be adjusted to meet the timing needs of many applications. An on-chip monostable circuit incorporating a pulse type output has been included. By selecting the appropriate output along with the correct input clock frequency, a variety of timing intervals can be achieved. Clock inhibit and set/reset input are also provided. The first 8 flip flops may be bypassed if desired. The maximum clock frequency for this CMOS is 3MHz at 10 volts, and the counter advances on the negative going edge of the clock pulse.

The MC 14534CL is a CMOS circuit composed of five decade ripple counters that have their respective outputs time multiplexed using an internal scanner. Outputs of each counter are selected by the scanner and appear on four BCD pins. The selected decade is indicated by a logic

Continued on page 139



Motorola MC14534 & MC14536

Charles Lingo WA4RSX
2814 S.W. 5th Street
Miami FL 33135

DIPOLE ANTENNA TUNING

Much of what has been written about antennas, includes something about tuning. Relative to the dipole antenna, the procedure is to add or subtract from the lengths of the legs. This is what I am writing about, except that presently I can stand on the ground and change the lengths of the legs of the dipole by merely pulling or pushing the transmission line. The drawings are almost completely explanatory. They describe the additions I made to my 40m Inverted "V" Antenna.

If you study the drawings a moment, you will see portions of the two legs of the antenna pulled into an aluminum pipe, which acts as a shield against pickup and radiation of radio frequency energy. The pipe is grounded of course, and each leg of the antenna is insulated for at least 3 meters beginning at the center of the dipole. I made my antenna from an old length of coax cable. The braid is stripped from the center conductor and insulation in one piece, and is

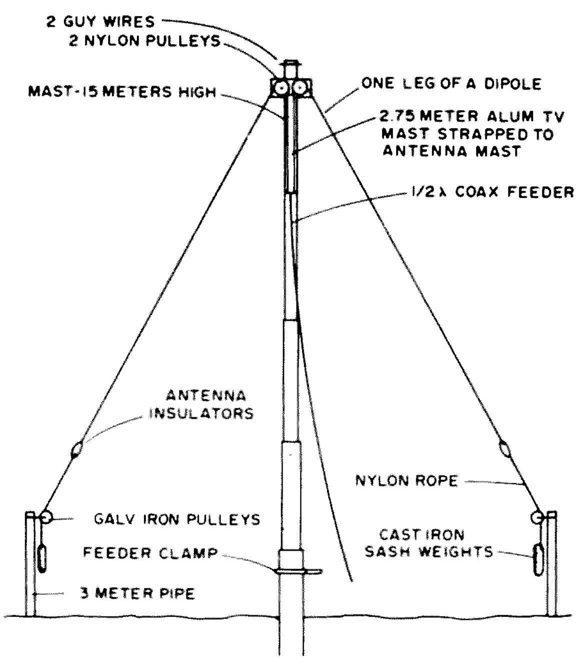


Fig. 1. Overall view of system.

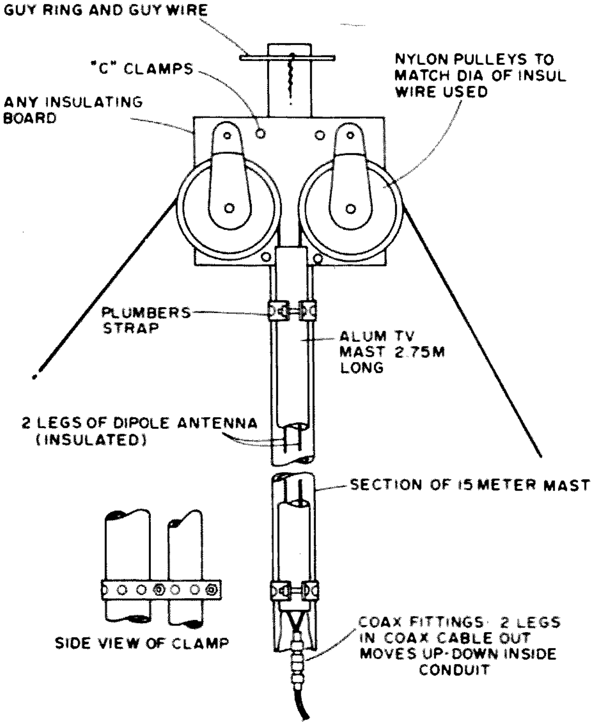


Fig. 2. Details of pulley mechanism at Apex.

taped to prevent contact with the pipe shield or any other metal part. The center conductor with its nylon cover is ready to be used.

The two wires, at one time antenna and at another time transmission line in a pipe, raised a question in my mind. What would happen to the impedance and SWR? Could a low SWR be obtained? There was always a chance that a combination of lengths, change in position, etc., might compensate for the variable and unknown impedance, so I made alterations to my antenna and gave it a trial run. SWR's between 1:1 and 1:2 were easy, and quickly secured.

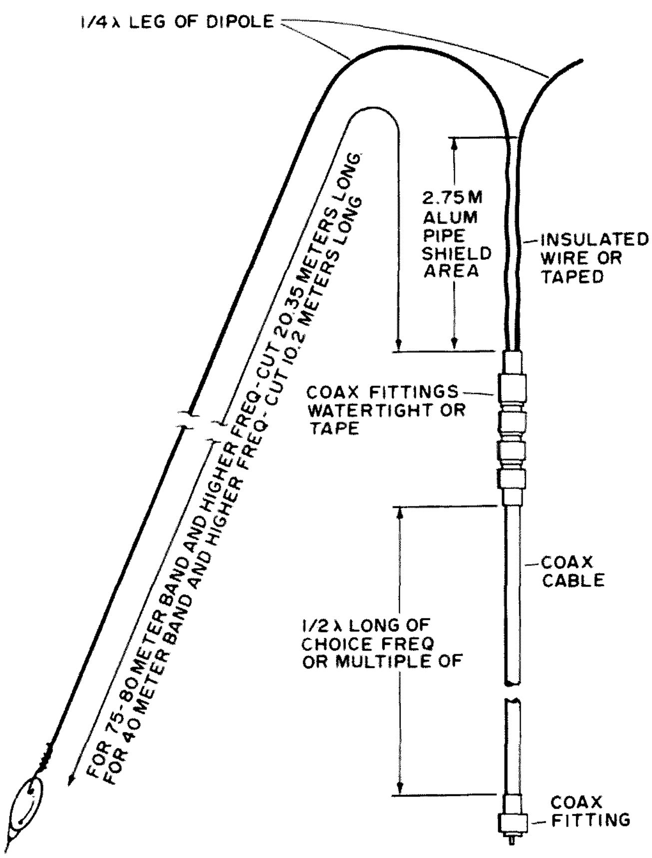


Fig. 3. A look at the actual antenna minus the supports.

Above the 80 and/or the 40-meter band the antennas act as harmonic antennas, for all higher frequencies, at least to the limit of the pipe shield length. Very little change in length of the legs is necessary to tune to the exact wavelength desired. It is recommended that the transmission line be calibrated for the most used frequencies so one can shift from one to the other without any trouble.

. . .WA4RSX

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6 meter	Single	25 dB	2 dB	$15.50	$18.50
2 meter	Single	20 dB	2.5 dB	$15.50	$18.50
2 meter	Double	40 dB	2.5 dB	$30.50	$36.50
220 MHz	Single	17 dB	2.5 dB	$15.50	$18.50
220 MHz	Double	35 dB	2.5 dB	$30.50	$36.50

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Peter A. Stark K2OAW
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Mt. Kisco, NY 10549

The original K2OAW counter.

Latest Counter Update

When I first wrote the article "A Modern VHF Frequency Counter" back in early 1972, I didn't expect anywhere near the enthusiastic response it received. Within a short time I got letters from almost every state as well as a number of foreign countries asking for printed circuit board layouts and further information. In addition to the two printed circuit suppliers listed in the original article, several groups of amateurs in various states have gone into business selling boards at hamfests and club meetings. In short, there are hundreds, and perhaps even thousands, of these counters already in existence.

So now, perhaps it is time to look back at the original design and talk about some modifications and improvements, as well as a few hints and solutions to common problems. But, there is an old Bulgarian proverb (or maybe it's Transylvanian or something) which says – "If it works OK, don't louse it up." In other words, the original design is still sound, and if you are satisfied with its performance, don't change it. With that warning, here goes.

Where to get Information

The original article appeared in three parts: Part I, May 1972 issue of 73 Magazine, carried the basic description and parts list. Part II, July 1972 issue, carried the logic diagrams. Part III, September 1972 issue, had the printed circuit board layouts and parts location drawings. The entire article has since appeared in a Tab book; *RF and Digital Test Equipment You Can Build.*

In addition, 73 Magazine in November 1972 had some corrections, and an article by W9CGI in 73 Magazine for June 1973 had a variety of suggestions on possible modifications. The June 1972 issue of 73 Magazine had an article on a separate VHF frequency scaler using the same Fairchild IC as the entire counter, but using a slightly different circuit. And the March 1974 issue had an article by W4CUG on increasing the speed of the counter.

At the present time, printed circuit board layouts are available from me if an SASE is enclosed. Etched boards seem to be available from many sources, including the following: Westrock Repeater Association, P.O.Box 403, Bedford, N.Y., 10506; and D. L. McClaren W8URX, 19721 Maplewood Avenue, Cleveland, OH 44135. The former is our local repeater association which will put to good use any slight profits it might make on the boards.

Low-Frequency Input Sensitivity

My original prototype had an input sensitivity of roughly 200mV or so on the low-frequency input, but many readers reported being unable to get anywhere close to this figure. We have since built several counters, and all except one had a sensitivity of less than 400-500mV; but that one bad

one needed almost 2V to operate properly.

The original design used a 40673 MOSFET in a direct-coupled circuit which had only one isolation capacitor – at the very input, to avoid upsetting the MOSFET bias with any stray dc input voltage. It turned out to be a compromise in an effort to get a simple circuit, with high input impedance, which would work at very low audio frequencies. But direct-coupling from the MOSFET directly into IC1, the Schmidt trigger, forced the MOSFET to operate at very low drain voltage, which is not a very good idea. With the addition of four components, as shown in Fig. 1, it is possible to capacitor-couple the MOSFET to IC1; this allows the MOSFET to operate in a more linear portion of its range and provide more gain. Using a 0.1 μf disk capacitor for coupling, our unit performed down to about 100 Hz with an input sensitivity of roughly 50 or 100mV. The two 1N914 diodes are included to protect the input of IC1 from excessive voltage deviations; theoretically they should be included, although we have operated our unit without them with no damage to the IC. The 2200Ω resistor should be selected, if needed, to make the input voltage into IC1 approximately 1.2V dc with no ac input.

The printed circuit design has no room for these added parts, so you will have to modify it slightly by cutting the copper conductor going from the drain of the MOSFET to pin 4 of IC1. Connect the capacitor across the break in this conductor, and connect the 2200Ω resistor between pin 4 and pin 7 (ground). Measure the dc voltage at the input to IC1, and if it is much different from 1.2V or so, substitute a slightly different resistor value – lower to drop the voltage, higher to increase it. All of these components, as well as the diodes, if

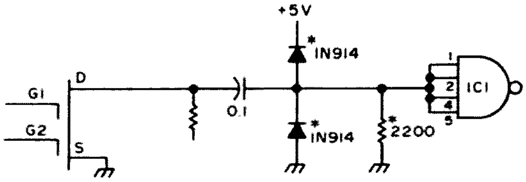
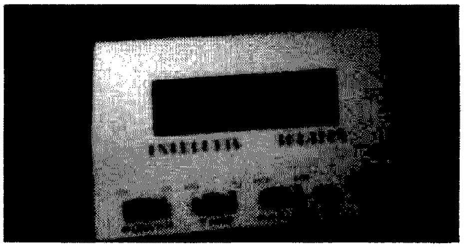


Fig. 1. Adding the starred components to the low-frequency input circuit (Fig. 3 in the original article) yields somewhat improved input sensitivity.



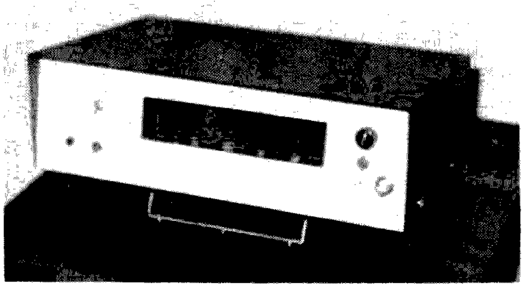
WB2CHW's version of the counter.

you use them, should be mounted on the bottom side of the board.

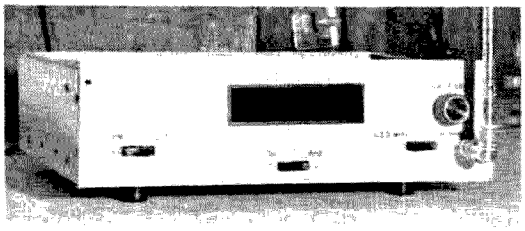
VHF Scaler Operation

Some readers have had trouble with the scaler portion of the counter. The Fairchild 95H90 scaler IC costs $16, and so swapping ICs is not a popular troubleshooting method here! There have been a number of reasons for problems, the main one being that a sizable percentage of 95H90's have been defective right off the production line. Apparently Fairchild had some production problems at the beginning; but rumors have it now that the presently available ICs are better, and so we should see fewer and fewer troubles as time goes on.

The first thing you need is a way of testing the 95H90. This is not easy, since you have to test it under operating conditions and that means building another scaler. If you know someone else who has built the counter, perhaps you can interchange ICs. Another alternative is to build the VHF scaler written up in the June 1972 issue of 73 Magazine. To make sure you don't have other problems with the layout, be certain to use the same printed circuit pattern given in the article; you can make your own or obtain the small board from one of the board suppliers listed earlier. If your IC doesn't work in the simpler scaler circuit, then it's almost a certain bet that the IC itself is bad. (Two comments about the June 1972 scaler. First, make sure to use a good stiff 6V battery – a lantern battery is best. Don't try to use some AA cells, as the IC takes a lot of current. Second – and this is a long story that I won't repeat – the resistor labelled .18K in the article is supposed to be 180Ω.)



WA9FCM's version.



And one built by K5PQK.

And by Don Hoos.

An interesting sidelight is that many readers wrote me to say that the 2N5771 specified in the scaler doesn't exist. Though it is listed in the Allied catalog and should be available from any Fairchild distributor, somehow it seems hard to get. Fortunately there is nothing magic about it, and many silicon PNP switching transistors will work just as well as long as they go up to high enough frequencies – for example a HEP52 or HEP715.

We have also found that the 95H90 IC in the scaler is very temperature and voltage sensitive. In normal operation it runs quite warm, almost hot. You can put your finger on it, but sometimes it is not very pleasant to keep it there for long. Hence, if you adjust the bias pot in the scaler while the unit is cold, it will not work well after everything warms up. The best solution is to cement a small aluminum heatsink to both scaler ICs and let everything heat up before adjusting the bias pot for best sensitivity. Mounting the bias pot on the outside of the case, or at least making sure you have a small access hole in the case that you can stick a screwdriver through to adjust it is also very helpful. But if you mount the pot off the board, make sure to use very short leads, and bypass the pot at the board end with a 0.01 μf disk capacitor.

The scaler ICs are designed for use with *negative* power supply voltages, with pins 4 and 5 grounded, and pin 12 connected to -5.2V ±5%. In practice, most users reverse the connections and then use a +5.2V supply, since this makes it compatible with TTL ICs which need 5V. Since the allowable voltage range is then 5% above or below 5.2V, the IC is *supposed* to work at 5V. But that is not always true – we have run across a number of ICs that needed at least 5.1V, and sometimes even 5.2 or 5.3V. Some people have found that a slightly lower voltage, on the order of 4.9 or so, works better, but that is rare. In any case, if you find your IC is good but it won't work at 5V, try a few tenths more or less. (Note that the scaler in the June 1972 issue of 73 Magazine used 5.3V.) But be careful – the ECL ICs will easily stand up to 5.5V (the catalog says 6, but don't try it) but the TTL ICs are doomed above 5.25 or so (not always, but you've got thirty some ICs on that board so be careful). Adjusting voltage is not very easy with the LM309K regulator, but the alternate power supply in Fig. 18, of the original article is easily adjusted up and down, and will allow you to find the best operating point for the 95H90. If you have to go above 5.1V, it might be a better idea to build a separate supply just for the scaler ICs, and keep the rest of the ICs at 5V.

Power Supplies

If you used the LM309K regulated supply, you have already discovered that one of the diodes in the circuit was shorted. But whichever power supply you used, a "crowbar" circuit is a good idea. It is simply a 1A fuse in the 5V power line, followed by a 5.6V hefty Zener to ground. If for any reason the regulator should fail, the Zener blows the fuse. As to other problems – one reader got an LM309K that *oscillated* – the counter did very strange things as a result. The problem had something to do with parts placement; we finally got it to stop by removing the 0.1 μf disk capacitor at the output of the power supply. Still haven't figured out why.

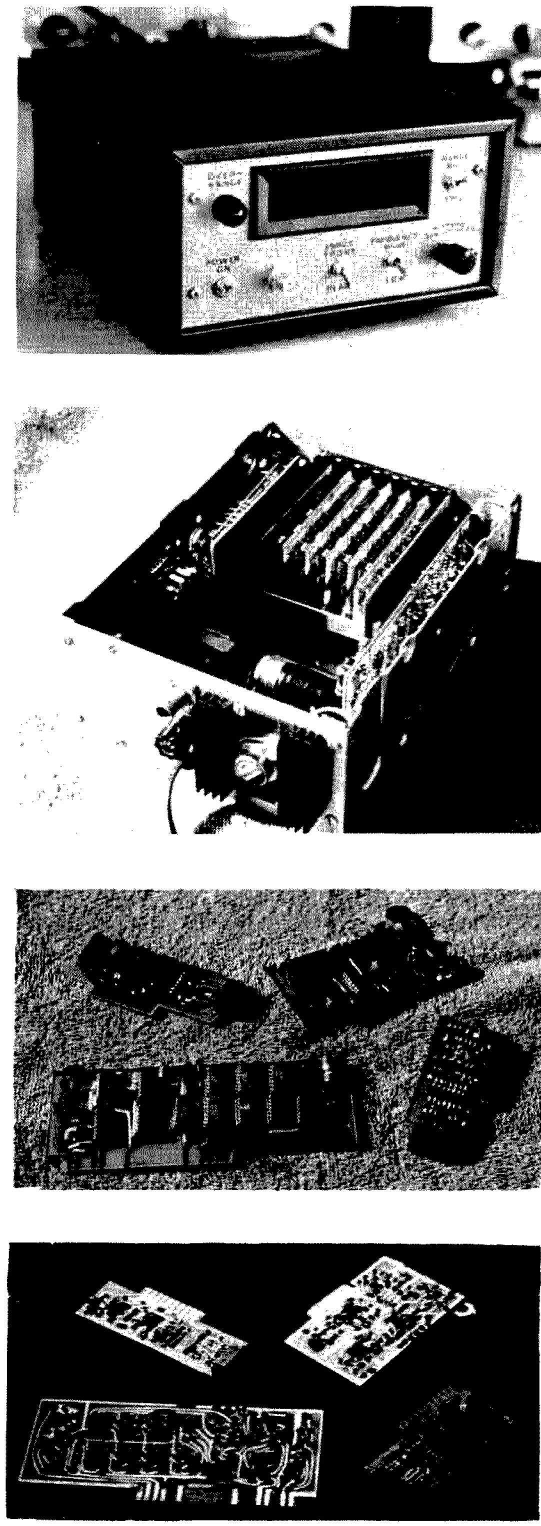
Occasionally, the LM309K does not regulate its output voltage drops below 5V. Assuming that you don't have a short which draws excessive current, the reason is probably that the output voltage from the rectifier is too low. A 6.3V filament transformer in the power supply provides an input into the regulator of about 9V, which is just above the minimum that the LM309K needs. Occasionally we get just the right combination of low transformer voltage along with a slightly weak regulator, and then it just stops regulating. The solution is to try a different LM309K or a larger 6.3V transformer. The best solution would be to use an 8V transformer, but these are hard to get. Don't do what one reader did, though, running into this problem, he simply switched to a 12.6V transformer, which gave him almost 18V into the regulator. Even though the LM309K was mounted on a gargantuan heat sink, I burned my finger on it when I accidentally touched it. It worked, though.

The final problem is with the adjustable power supply in Fig. 18, of the original article. About three or four readers found that it did absolutely nothing when the scaler ICs were plugged in. As long as the 95H90 was unplugged, everything worked fine. But plug in this IC, and the 5V line went to 0V. Absolutely dead. Shorted IC??? No!

WB2AAQ finally found the solution with his power supply, and his solution has worked for others as well. The problem is caused by the fairly high current drain of the 95H90, combined with a high input offset in the 741 op amp used in the regulator. With the heavy load on the 5V line, the output voltage from the supply starts rising rather slowly. As soon as the voltage reaches a few tenths of a volt, the 741 looks at it and decides that the output voltage is too big – and promptly turns everything off again. WB2AAQ's solution was a very simple one, connect a 1 megohm resistor from ground to one of the 741 IC pins – pick whichever one makes the thing work.

Reference Oscillator Stability

Most counters built seem to have a very stable timing reference oscillator. For instance, W4ZUS found it held within 5 cycles at 10 MHz for several hours (and suggested a tubular trimmer for adjustment, as the lead screw gives a vernier effect for adjustment); K7DTS/1 found it held within 20 cycles. Others decided that an oven would give



Four views of WB2UKP's version.

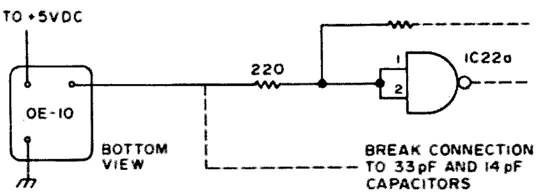


Fig. 2. Connecting the International Crystal OE-10 Oscillator to the crystal oscillator (see Fig. 7. of the orignial article).

better accuracy (WAØABI suggested that Gateway Electronics in St. Louis had a number of Collins 10 MHz crystals in 28V ovens for $2.50). But there were a few readers who found that the crystal reference oscillator drifted very badly during warmup, though it seemed to settle down after 15 minutes or so.

The problem here seemed to be a crystal which had marginal activity, so that even small changes in operating parameters would result in a great change in frequency. A possible solution would be to get a good quality crystal, such as the HA series crystal from International. But for just a few dollars more there is an excellent solution to the whole problem which works so well that I'm sorry I didn't think of it earlier.

For $19 you can order from International Crystal an OE-10 oscillator assembly, which is a complete oscillator, with crystal. If you specify 5V operation, they will even put it on frequency for you and give you a listing of drift against temperature. The unit I got was certified at 10.000026 MHz at -10°C (14° F), 10.000004 MHz at +25°C (77° F), 9.999958 MHz at +60° C (140° F), which is roughly .5 Hz drift per degree Fahrenheit. The rated temperature stability over the range from -10 to +60°C with respect to "room temperature" of 25°C is given as 0.0005%, while the tolerance *as shipped* is within 0.0001% at 25°C. All of this in a metal can roughly an inch square! No need to resort to ovens; in fact I didn't even bother to readjust it after receipt, since it seemed as close as I could use. And connecting it to the counter is done with three wires, as shown in Fig. 2. It is only necessary to lift one end of a 220Ω resistor off the board, and connect to it. Although the 33pf and 14pf capacitors and the crystal could be removed from the board as they will no longer be needed, I decided to leave them just in case I wanted to switch oscillators in the future.

Control Circuit Operation

Two types of erratic operation of the control circuits have been observed by readers. In one case, observed by two or three persons, the reset circuit sometimes operates sluggishly or not at all; this is remedied by increasing the value of the 100pf capacitor connected to pin 3 of IC32a (See Fig. 10, of the original article) to a larger value such as 200 or 500pf.

Another interesting malfunction was found and solved by W2CLL; I have since run across about three or four other counters with the same problem. In Bob's unit, when in the Hz position, the counter would provide the correct reading for one second, followed by a second of 00000, rather than showing the correct reading for a full two seconds before the next update. This was caused by an extra strobe pulse sneaking in at a time it shouldn't.

As shown in Fig. 11, of the original article, the S and RC (or CR signal, as it is called on Fig. 10), should be exact opposites of each other. But this isn't so, since the RC signal has to travel through a few more flip flops than the S signal in the Hz position. As a result, the S signal gets to IC32d sooner than it should, and forces IC33b to quickly set and reset at a time when it should stay reset; this generates an extra strobe pulse at the wrong time. I must apologize for this little mistake in the original design, but fortunately it only happens with just the right combination of ICs; hence only a handful of units actually have had the problem. The solution is very simple – slow down the S signal by putting a 470pf capacitor from IC31d pin 11 to ground. Actually, anything that slows down the S signal a little will work, including a small capacitor from any one of the pins of IC33b to ground.

Readout Selection

When I wrote the original article, I correctly predicted that the price of LED 7-segment displays would drop by the time the article appeared in print. It is now possible to get LEDS for as little as $3 a

piece, which is less than the comparable incandescent readouts. Hence a number of the counters have been built with LED readout. But this has led to two problems.

First, the Numitrons generally sold for $4 or so are priced very close to their list price, hence you are probably getting a new unit that has passed all the inspection steps. On the other hand, the $4 or so LED is probably a reject or at least has a questionable origin. That means you may get a dud. Watching out for words in small print like "no chance to test them" etc., is a help, but even that doesn't work. I paid $7.95 each for my Litronix LEDs in the original counter; so far three of the five have gone bad, and all in the same way – the element has shorted out to the decimal point, with the result that the decimal point lights instead of the e. And on top of it all, it has been difficult to get replacements cheaply, since until recently you couldn't tell whether you would get the Litronix, an Opcoa, or perhaps a Monsanto unit when you ordered the $4 special. Since the numbers look a bit different, the only way to be safe was to get a new set of all five.

The second problem is that LED readouts come in basically two types – those with common anodes, and those with common cathodes. The 7447 decoder/drivers used in this counter require the *common anode* LED, and will not work with common cathode LEDs. The common cathode units can be driven with a 7448 decoder/driver, although the 7448 was not designed for that purpose. Use the circuit of Fig. 3 if you choose to use common-cathode LEDs. Since the pin numbers on the 7447 and the 7448 are the same, no changes need be made on the main pc board. The display will be a little dimmer than a common-anode LED with the 7447 but don't reduce the values of the 680-ohm resistors as this may damage the 7448 driver. (Another LED readout, containing an array of dots, isn't seven segment and therefore would require large changes in the counter board – don't use it unless you are willing to change the layout.) Since most of the LED advertisements compare the LEDs sold with the Monsanto MAN series, Table 1 gives some information on these units.

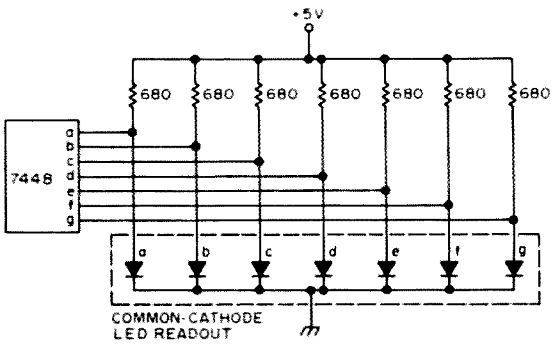


Fig. 3. Connection of a common-cathode LED readout to a 7448 decoder-driver.

Several readers have asked how to interface Nixie tubes with the counter; although this is not recommended, a layout for Nixie tubes (using unknown Nixies with wire leads) is available from me for an SASE.

A number of readers have asked how to add three more readout indicators to the counter. This modification is not recommended to anyone who has to ask how to do it. First of all, the drive requirements for strobe and reset pulses are marginal, the power supply is marginal and the extra three indicators don't really tell you anything you didn't know before. In fact, the extra indicators will only read when in the Hz position anyway, since the counter is not fast enough to read out in more than 5 digits in the kHz position. Hence you are automatically stuck waiting two seconds for a reading, when in the kHz position you could have had the same reading in a tenth of a second. Finally, it requires major changes to the printed circuit board, and hence seems more effort than it is worth.

Other Modifications

Several readers have asked for a modification to extend the range to at least 450 MHz. As the cheapest IC to do the job right now costs $55, I have not even thought about it twice. Plessey makes a flip flop that goes above 1000 MHz, but costs over $100; all of you readers out there are invited to try your luck with these – not me. It should be possible to build a flip flop that goes to 450 MHz out of discrete components (tunnel diodes, perhaps), but that appears to be a difficult job.

Several readers have suggested that the first decade divider in the counting circuits

(IC5 and IC6) be replaced by a faster IC, such as perhaps a Schottky 74S73. This seems like a fairly good idea, except that I haven't done it yet. This method should extend the low-range to perhaps 80 MHz; a simple ECL flip flop would then double the range to 160 MHz without the need for a $16 scaler IC, enough to cover the 2m band. But the scheme has two disadvantages – it doesn't cover 220 MHz, which the 95H90 does, and it also requires the redesign of the MOSFET/Schmidt trigger input circuit, since the 7413 is not available in a Schottky version. Further, to get a direct frequency readout, it requires some additional switching in the time chain dividers to give an extra division by 2, which lengthens the readout time in the HZ position to 4 seconds. This idea is presented to those readers who wish to make the modification, but as before, it is not recommended by me for the simple reason that it seems more effort than it is worth.

A simpler modification is to replace IC4 and IC5 with their Schottky equivalents, and then try several ICs as IC3 and IC6, picking the fastest. This can greatly improve the frequency range via the low frequency input. See the article by W4CUG in the March 1974 issue of 73 Magazine.

Finally, in his article in the June 1973 issue of 73 Magazine, W9CGI suggests several changes to improve the counter. The one given as Fig. 1, in his article is not recommended, as it violates TTL design rules. But the one in his Fig. 3, has merit, if we connect the left end of the 10K resistor to IC33a pin 15, rather than IC29 pin 11. When the counter is in the Hz position the added indicator will blink on for one second, and off for one second. It then indicates that the counter is counting when the light is on. This is a very worthwhile addition, since it enables you to make slight circuit adjustments when the light is off, and then use the next count interval to give you the next reading. I have used this technique (without the light, though) for adjusting 2m FM transmitters on frequency. The fine adjustment is done in the Hz mode, at which time you have one second for making slight adjustments, followed by one second of frequency indication. This trick enables you to make one adjustment every two seconds, with no false readings in between.

To close these comments, let me again repeat the comment made at the beginning, "If it works OK, don't louse it up." If you already have a counter which works, and works to your satisfaction, then leave well enough alone. The original design was basically sound, and there is no reason to fiddle with a counter which works well. Instead, pride yourself on having a good reliable piece of equipment, which you have built yourself. ...W

TABLE I Characteristics of MAN LED Readouts

MAN-1 – Red, 69mm (0.27") high numbers, common anode, DIP case, uses 7447 driver.

MAN-1A – Similar to MAN-1, but darker – has red epoxy case.

MAN-1B – Similar to MAN-1, but different decimal point connection.

MAN-1BA – Similar to MAN-1B but red epoxy case.

MAN-1001 – Similar to MAN-1 but only displays +, -, or 1.

MAN1001A – Similar to MAN1001 but red epoxy case.

MAN1002 – Similar to MAN-1 but intended for hexadecimal display; can be used in counter same as MAN-1 but don't try to use decimal point.

MAN1002A – Similar to MAN1002 but red epoxy case.

MAN-2 – Alphanumeric display consisting of dots. Don't use.

MAN-2A – Similar to MAN-2 but has red epoxy case.

MAN-3 – Red, common cathode, 29mm (0.115") high numbers, flat case with different pin connections from MAN-1, uses 7448.

MAN-3A – Similar to MAN-3 but has red epoxy case.

MAN-3M – Similar to MAN-3A but has different pin arrangement.

MAN-4 – Red, common cathode, needs 7448, 48mm (0.19") high letters, DIP case but different pin connections.

MAN-5 – Green, otherwise similar to MAN-1.

MAN-6A – Red and 1.42cm (0.6") high numbers, a wide DIP-style case, but otherwise similar to MAN-1A.

MAN-66A – Similar to MAN-6A.

MAN-8 – Yellow, otherwise similar to MAN-1.

MAN-10 – Similar to MAN-1, requires slightly less current.

MAN4001 –Similar to MAN-4 but only displays +, -, or 1.

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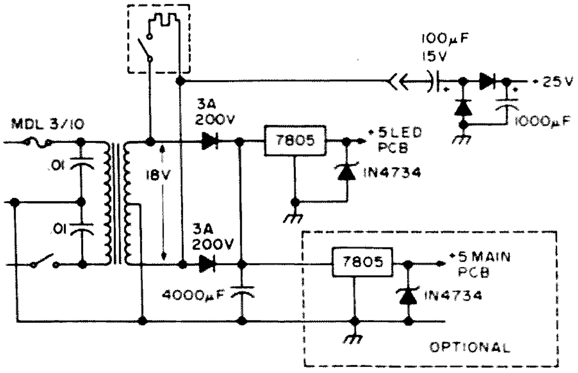
Who Needs a 5V Supply?

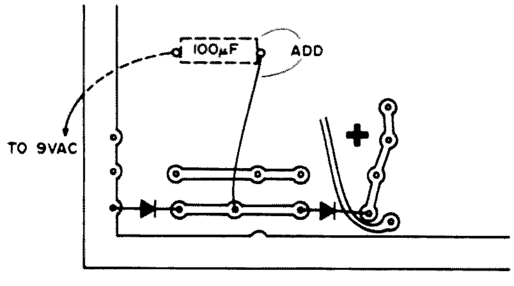
K2OAW counter builders do, for one.

The K2OAW counter published in 73 during the summer of 1972 has created a great deal of interest in counter construction. I know personally of a half dozen already completed and perhaps another dozen in various stages of construction. Every time the subject comes up there seems to be considerable interest in the modified power supply I use on my counter. The changes are nothing unusual but they do make for a simpler, more compact unit.

At the outset it should be known that my counter includes a surplus Collins crystal oven for the time base which required a source of heater voltage in addition to the normal requirements of the counter proper. The counter requires 5V regulated at slightly over 1A and 20–30V at a few mA for the input amplifier. The oven in use requires 28V at 1A according to the nameplate. I used an 18VCT transformer at 2A to supply all of the above. The entire winding is used to heat the oven, while this is less than the stated voltage the oven starts cycling in approximately four minutes. . .which is satisfactory. The winding is full-wave center-tap rectified and applied to Fairchild (or equivalent) 7805 IC regulators to provide the 5V for the LEDs and logic. It would be safer to provide separate regulators for the two functions but my counter has worked nicely for over a year with a single 7805. LM309K regulators would work as well if they are more readily available. I personally prefer the 7805 due to the relative ease of mounting the TO-220 case as compared to the TO-3 of the '309K. The 20V for the 40673 input amplifier is provided by a voltage doubler working off half of the winding. The series capacitor is added to the main counter PC board immediately in front of the existing 1000µF electrolytic. Jumper wire under the board connects the capacitor to pads originally intended for the bridge rectifier. Only two diodes are now required. The 5.6V Zener was added to the output to act as a crowbar to insure the primary fuse will blow if a regulator were to fail.

. . .WAØABI





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How To Win A Big Contest

To win an Indy 500 or Grand Prix one would need more than average luck. You must have a good car that is super tuned and be in good shape yourself. To make it in the Top Ten of WW contest one must have a rabbit's foot (or whatever), a rig that's working smoothly and be able to do the 48 hour stint 'in a breeze.'

Many hams who make it to the immortal plane of the fortunate few, don't have a $10,000 set up or a 10kW linear in the ceiling. Nor do they have 10-elements stacked up 30.5m (100'). Their rig and antennas are mainly standard commercial products often running at less than the full gallon. How then do they tote up such fantastic scores? Well, if it's not a 'freak' QTH, then it must be the operator who has that something extra.

Contest caperers come in two types. There's the casual 'goer' who's only in it for a few new countries or prefixes; knows he can't figure in a place but just wants to help swing the scene along a little. The other is a 'fair dinkum' trier whose mind is fixed on a tangible reward such as wallpaper, a medal or plaque etc.

Those who finally make it to the Top Ten are:

1. Under fifty years of age. There are exceptions but OT's by reason of advancing years are handicapped out of a two day 'sweat.'
2. Are fast, efficient and have a smooth operating technique.
3. Able to go non-stop all the way without brain 'fag.' This is where the 'extra' comes into play and the men begin to show out from the boys. Human stayers are like racehorses, born rather than trained. But many who do have this stamina and ruin it by their approach and 'modus operandi.'

It's easy enough to stay awake for a weekend but to remain alert all this time while riveted to the rig and having your head pounded by QRM is a different matter altogether. Concentration is intense and the amount of mental energy expended is staggering. No wonder fatigue finishes off so many.

To excel, one must be fit. To assume that because amateur radio contesting is a sit-down struggle good physical shape doesn't count is a bad mistake. Those with good muscle tone 'stay' long and well. Like the rig he owns, each person knows best how to tune himself up. But six weeks jogging before a big 'scrap' should bring him to the rig on the gong, fit enough to eat it rather than work it. These ops are already half way there.

No boxer goes the distance without those vital between round rests – and they're just as important in a 48 hour contest. Those who cannot pace themselves fail. A short break away from the rig once every hour is a must. Resist the temptation to stay even if the whole band is calling. Get up and walk around for three or four minutes until your circulation is restored to full bore. Then return to the fray with concentration renewed and muscles relaxed.

If sleepiness is your problem, maybe it's best not to make the operating chair too comfortable. However, remember, physical discomfort saps concentration. So the idea is to sit 'loose.' A foot rest, a fairly low desk on which the arms hang slack at ease, a chair with an adjustable back support and all controls within effortless reach. All of this will add 5% to the total score.

All right, so you and the rig are GO. But don't forget that Lady Luck still holds the trump card. Without her favors you're an also ran. There are two sorts of luck and you'll need all that's going of both. It is vital to get away to a good start; fast flowing QSOs and not too much QRM. One must be up with the field at the half way mark to have any chance. Unlike many competitions, it is almost impossible to come from behind at the end and win. Also in any WW 'scrap' ionospheric conditions vary considerably between hemispheres and continents. It may happen that from your QTH all circuits on all bands to Europere out. Such a loss in DX and activity may be too much to lose.

Relaxation should be the aim for a day or so before a big contest. But many hams, excited at the prospects and urge to do better, go crazy and attempt impossible tasks. Some have the compulsion to change their sky-hooks and find right on starting time that the SWR is like their blood pressure – sky high. Others drive long distances to an S9 Eldorado and by the time the antennas are up, the gear assembled and the snags out, they're ready for bed not a contest. Some decide on last minute rig modifications. Anything from building a new final to attempts to sharpen i-f selectivity. The bell goes and half the equipment is still in pieces on the table. When minor adjustments can have disastrous consequences. I once went out to tighten a slightly slack leg of my 80/40m inverted Vee. It broke off right at the apex. When I attempted to lower the aerial I found that the pulley wheel at the top of the mast was rusted. Profanity in several tongues proved useless, so that was that. Moral: HAVE EVERYTHING TESTED AND READY DAYS BEFORE ANY BIG EVENT. EVEN IF SOME SMALL THING PROVES TO BE AMISS ON COUNTDOWN, LEAVE IT IF YOU CAN.

A weekend international contest is a hard road and it takes an old dog who knows all the tricks (ethical ones), to win. Psychological pressure plays a part. You must appear to be 'movin' it along' at all costs. If the mode is A1 send as fast as conditions allow. Sound slightly aggressive. Don't struggle with QRM, change frequencies. Never be turned off by a high scoring competitor. He may be a phoney, the results sometimes show this to be the case.

If the rules of a contest make it permissible to commence with any three number digit between 001 and 100, it is often wise to let a few minutes of the 'scrap' get under way and then kick off with a fairly high number around 070. The idea is to keep the true score to yourself and confuse others. Study the form of previous contests and be 'teed' up on who the opposition might be and the likely scores. Check the Iono charts for MUF times and best, use of all the bands. If you are a brass pounder vary the BFO tone regularly to ease brain 'fag.'

Keep a spare transceiver on hand, even if only a QRP job. Unless you are dead sure the race is lost never drop out. At all costs finish well; it might just nudge you into a place.

There are those cool contesting 'cats' who claim to use a keeper of the log. This extra hand and two ears is worth, they say, an added 10% in QSOs. Adjudicators might consider this a form of cheating but it's a breach impossible to police. This Man Friday help may work o.k. on phone where the digits given are an oral exercise but in my experience on CW it is NO GO combination. The pace is so hot and the QRM so thick, mistakes continually occur.

Hams, like all others, are drawn to an activity that throws up a challenge. And contesting is truly a stiff test of skill and stamina. There are many WW 'meets' each year and the fields in all continue to grow. There are the old familiar calls and the new. It's great to make it in the Top Ten but better still is the satisfaction that comes by taking on all comers.

. . .VK4SS

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Digital Wind Direction Indicator

Impress your friends – aggravate the XYL.

With the appearance of inexpensive and reliable magnetic reed switches on the surplus market, a digital wind direction indicator becomes quite easy to construct.

Magnetic reed switches are activated in the proximity of a magnetic field of sufficient intensity. Inexpensive ceramic magnets are readily available as magnetic memo holders, etc. These ceramic magnets, when placed near the reed switch, will cause it to "make" or close its contacts. The reed switches used in this wind direction indicator were purchased from Radio Shack in a pack of 10 for a little over $1.00.

By mounting magnetic reed switches in a circle and rotating a magnet about the inside of the circle, the switches will close as the magnet passes near them.

The rotating magnet system lends itself perfectly for construction of a wind direction indicator. If an "arrow" capable of following wind direction is used to drive the rotating ceramic magnet, appropriate switches would be closed thereby supplying wind direction data.

Our rooftop indicating device was constructed from a burned out muffin fan (rotron fan). The inside fan blades were ground off leaving only the rotating center piece. The ceramic magnet was bolted to the outer edge of this center section. With the use of a muffin fan your 'bearing" surfaces are already made up and this saves considerable design work. The wind "arrow" was constructed from ¼ inch copper tubing and tin can metal stock (see Fig. 1). This is attached to the center rotor with a metal plate and bolts. No doubt, other magnet rotating wind arrow devices can be created, however, the muffin fan assembly lends itself perfectly. After the arrow section is completed, a plastic protective spray should be applied to prevent weather corrosion, etc.

The magnetic reed switches are positioned at equal 45° intervals in a piece of ¼ inch plastic attached to the outer shell of the

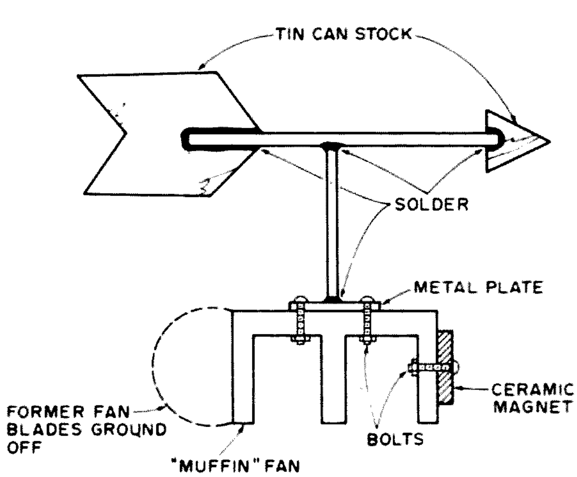


Fig. 1. Wind direction rotor assembly.

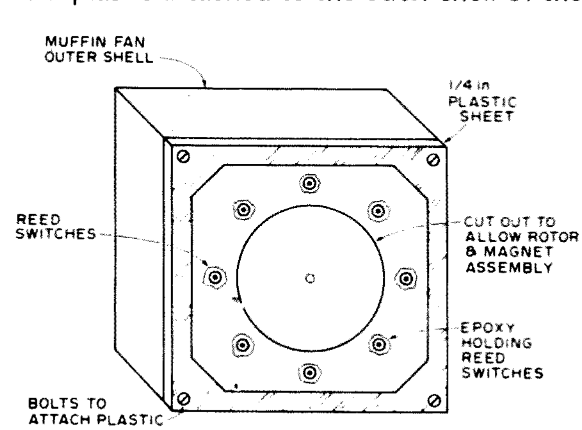


Fig. 2. Mounting of reed switches.

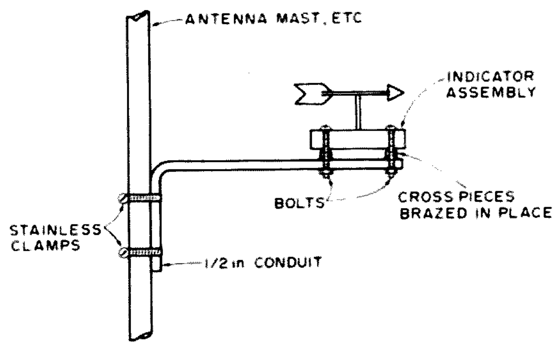


Fig. 3. Indicator to mast attachment.

muffin fan. The plastic was drilled so as to admit the reed switches and they were held in place by epoxy cement. It is necessary to plan the position of the switches before mounting them permanently so as to insure that they will be activated by proximity of the rotating magnet. (See Fig. 2.)

In order to attach the muffin fan assembly to an existing rooftop mast a bracket must also be devised. One-half inch steel conduit was bent so that stainless steel clamps could hold it to a main mast and it would extend out at a 90° angle. Two cross pieces of ½ inch conduit were then brazed to the main ½ inch stock so that bolts inserted through the muffin fan frame could hold the entire assembly in place. (See Fig. 3.)

Transmitting the reed switch information from the rooftop indicator to an inside readout device would normally require quite a cable (9 wires). With binary or digital techniques, common four wire television rotor cable will convey all the necessary data.

In binary notation, eight different wind directions are represented as 0-7. Therefore, 0 = NW, 1 = N, 2 = NE, 3 = E, 4 = SE, 5 = S, 6 = SW and 7 = W. Considering that 0 requires no reed switch, only seven switches are required in the rooftop indicator with one blank position (0 or NW). If you will observe Fig. 7, it illustrates how ground and + 5 VDC coming down the A, B and C rotor wires represent actual numbers or indicators

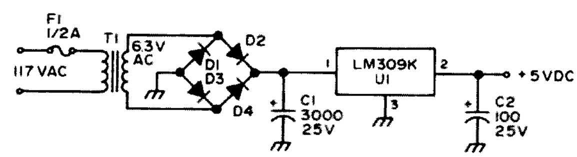


Fig. 4. 5V power supply. D_1 - D_4 – IN4002 Silicon Diodes. T_1 – 117AC to 6.3 AC at 1 amp. filament transformer. C_1 – 3000 µF,25V elec. capacitor. C_2 – 100 µF, 25V elec. capacitor. U_1 – LM309K voltage regulator (5VDC).

when translated by the digital decoders (Fig. 5). The fourth (spare) rotor wire is at ground potential.

The SN7442 decoder (Fig. 5) translates the binary data back to decimal indications. The SN 7404 inverters "turn on" the driver

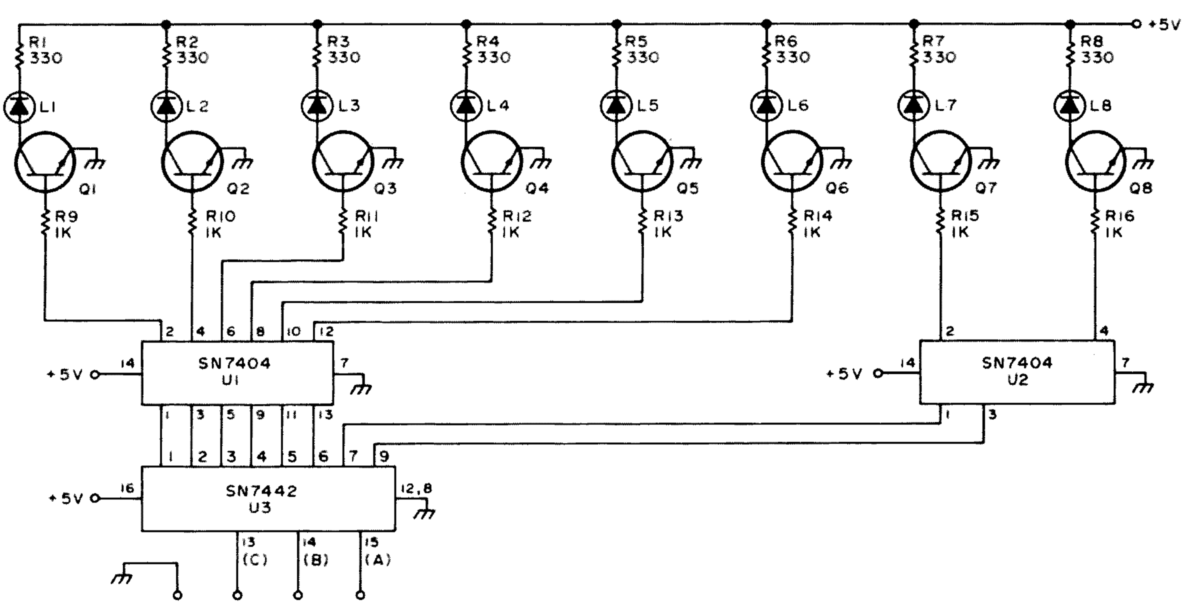


Fig. 5. Decoder and readout. U1-U2 – SN7404 Integrated Circuit. U3 – SN7442 integrated circuit. Q1-Q8 – 2N3641 NPN transistors. R1-R8 – 330 ohm, ¼ watt resistors. R9-R16 – 1000 ohm, ¼ watt resistors. L1 – L8 – Red LED indicators (most surplus houses).

transistors which in proper sequence illuminate the LED direction indicators.

To convert the 7 reed switches (and absence of a reed switch or blank position) to binary data, a diode matrix becomes necessary. (See Fig. 6.) Almost any silicon diode, such as the 1N914 or 1N4148, can be pressed into service in this matrix as the voltages and current required are quite low.

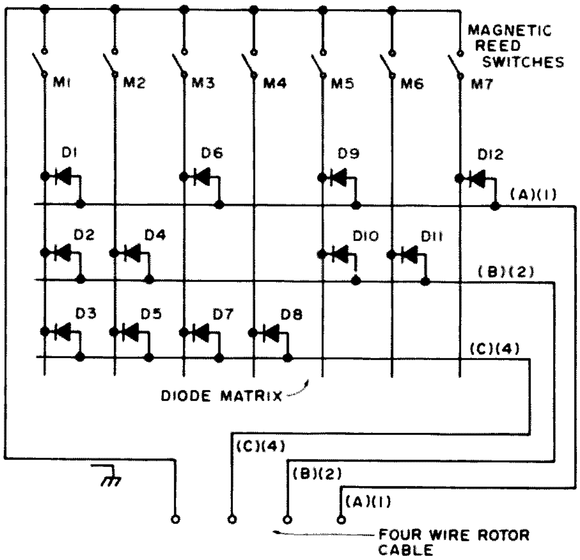


Fig. 6. Diode matrix. D_1-D_{12} = IN914 or IN4148 silicon diodes. M_1-M_7 = magnetic reed switches. (Radio Shack – 10 for $1.19.)

Our particular diode matrix has constructed on a small printed circuit board and installed inside the muffin fan outer assembly on the rooftop indicator unit.

The bottom section of the rooftop indicator can be sealed against the elements by installing a "bottom' piece of plastic. Silicon sealing compound or epoxy cement will work well to seal the joints between plastic and the muffin fan base. The top

C 4	B 2	A 1	ACTUAL NUMBERS	INDICATORS
0	0	0	0	N
0	0	1	1	NE
0	1	0	2	E
0	1	1	3	SE
1	0	0	4	S
1	0	1	5	SW
1	1	0	6	W
1	1	1	7	NW

Fig. 7. BCD logic table. 0=ground. 1=+5 VDC.

section of a plastic gallon jug will work well to make a top protective cover, however, the reed switches are sealed in glass which protects them from weather conditions. The diode matrix was sealed inside a small plastic parts box to protect it from the weather.

The LED readouts on the inside wind indicator can be arranged in a circle with appropriate wind directions applied with decals of the "press type." Our indicator box was constructed of clear plastic with a white plastic front which contained the circle of indicator LEDs.

This entire unit is quite simple to construct and is reasonably inexpensive, considering the cost of surplus market integrated circuits. Creativity is essential as well as a well stocked junk box or local surplus electronics store.

The digital wind direction indicator is another device which will aid in cluttering up your ham shack, assist you in spending money, aggravate your XYL due to construction time and impress your friends when viewing this spectacular creation.

. . .W2AOO

Emergency Ferrite Beads

In cases of TVI, a ferrite bead slipped over the base, collector, grid or plate lead of the offending stage can be a lifesaver. The compact choke is also utilized in top-quality laboratory oscilloscopes and spectrum analyzers to stop oscillations which sometimes go unrecognized as the cause of excessive power dissipation in a device.

Recently in the lab, a sudden need arose for ferrite beads and none were in stock. An effective solution was reached by using the threaded ferrite tuning slugs from small VHF inductors. One useful type has the hex hole throughout to accept the alignment tool.

If VHF frequencies are to be suppressed, select a slug from a surplus coil which has 3 to 5 turns, to insure that the ferrite material is appropriate for that frequency range.

. . .W4ATE

Lou Macknik W8KBC
96 Fernwood Avenue
Dayton OH 45405

Build a 2m Frequency Synthesizer

Complete construction details.

Part II

Part I (published last month) of this series gave a general description of the FS-220 frequency synthesized HT-220. It included a block diagram and just a hint of what the rig contains. In Part II I will give you a detailed description of the circuitry and how it all works together.

Reference Oscillator

The reference oscillator for the FS-220 is an AT-cut series resonant 10 MHz crystal in virtually the identical circuit used by K2OAW in his frequency counter and frequency synthesizer ("Frequency Synthesizer for 2m FM, Part II," 73, October, 1972). Reference his article for this and other circuits to come.

10 MHz Divider Chain

The 100 kHz square wave for the clock generator and the 1.111 kHz reference for the phase detector are derived from the 10 MHz crystal oscillator through a four stage divider shown in Fig. 2.

Phase Detector

The phase detector presently in use in my rig is the one described by K2OAW (October, 1972, 73). A 0.47 μf capacitor was used for creating the triangular wave with the 1.111 kHz reference. I didn't have an MFE3002 MOSFET, so I substituted a 2N4351. Although the base connections are different it works well and is a few pennies cheaper. Everything else is the same as given by K2OAW. I also tried other phase detectors, including the MC4044P (Motorola). I was able to reduce the reference signal feed-thru to an acceptable level using one stage of active low-pass filtering. This discreet component detector is, however, more desirable since it uses fewer components in the long run.

Unlock Detector

I used the unlock detector from K2OAW's synthesizer also, since the one which was originally designed for the IC detector is not fully compatible with the sample-and-hold type of phase detector. I did not use the LED lock indicator as suggested by K2OAW. Instead, I connected the blanking lead from the 5-digit Minitron readout in the FS-220 to the output of the unlock detector. I also used this point to prevent the HT-220 relay from energizing. With these connections, the transmitter will

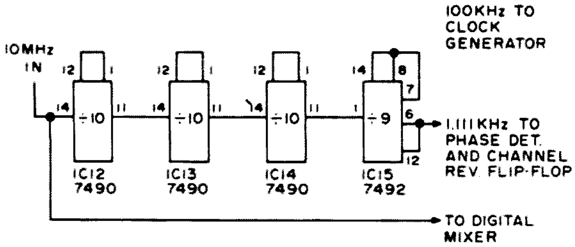


Fig. 2. Reference divider chain. Pins 2, 3, 6, 7, and 10 of IC12-IC14 are grounded. Pin 10 of IC15 is grounded. All IC's have pin 5 connected to 5 Volts.

not key and the digital display is blanked should an unlock condition be detected.

Voltage-Controlled Oscillator

The VCO consists of a Motorola MC1648P, using the essential ideas from K2OAW's article. Some changes were desirable. The varactor diode used at D1 was from a five-pack found at Radio Shack. A variable capacitor is used at C1. When the control line on the base of Q1 goes high (+3 to +5V) C1 is connected across the tank circuit, causing the VCO to tune the 14.000 – 14.443 MHz range. With the control line low, the VCO tunes 16.000 – 16.663 MHz. C1 was adjusted to provide about the same control voltage from the phase detector when working simplex on 146.52 MHz. The tuning range is actually a bit wider than required to insure that the VCO remains in lock at all times.

The dc control voltage must be extremely free from noise to prevent frequency modulation of the VCO. With all of the TTL logic in this rig, a great deal of care was necessary to keep the noise down. I found that a good part of the background noise on the VCO was entering through the switching transistor via the control line. Filtering this line greatly reduced background hiss and assorted weird grumblings.

The output of the VCO drives both the digital mixer and a switched buffer amplifier between the VCO and the frequency multipliers.

Programmable Divider

The techniques employed in this divider have been well published in the amateur magazines within the last year or so. The number N by which the counters are to divide is presented in BCD format to the individual 74192 programmable up-down counters. There is no fancy footwork required to shift to the receiver i-f frequency since in my HT-220 the i-f was an even megahertz. Circuitry must be provided to take care of the propagation delay in the ICs, however. K2OAW gave a good account of the techniques used for ÷N counters.

During receive conditions, the T/R logic sets pin 1 of IC 19 to +5V and grounds pin 10. This presets IC 19 to divide by three.

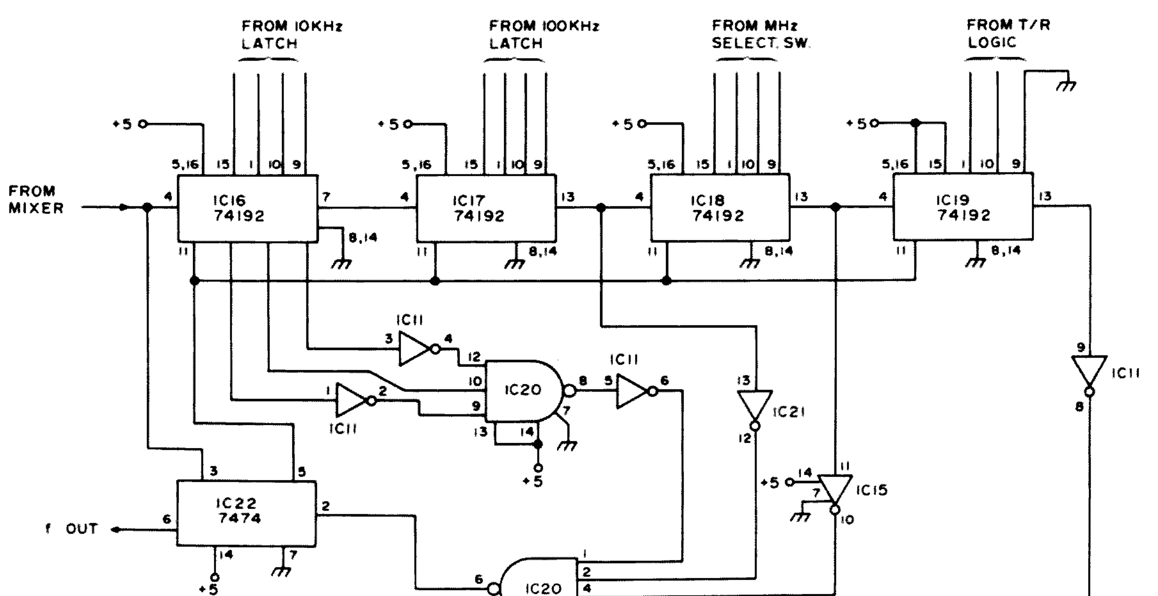


Fig. 3. Programmable Divider Chain (÷N). IC15, IC20, IC21, and IC22 initiate reloading 2 counts from 0000 to overcome propagation delay.

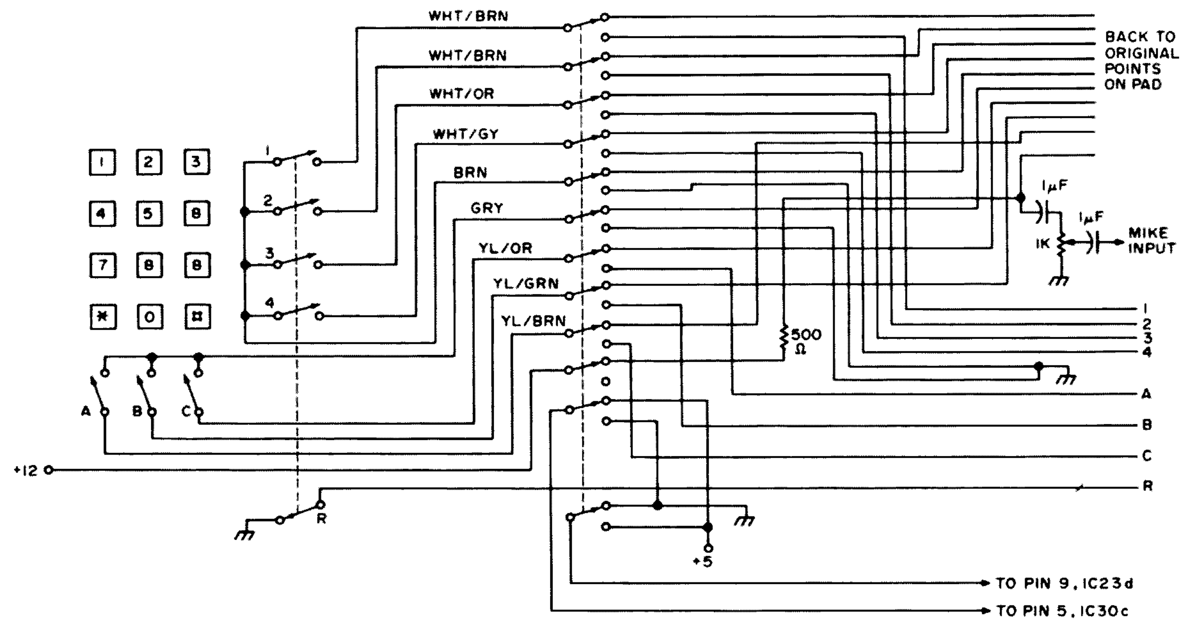


Fig. 4. Wiring of the Program-Operate switch which connects TT-pad switches to either the BCD encoder or the pad.

The MHz switch sets IC 18 to the proper divide number. In the 146 MHz portion of 2m, pins 15, 1, and 10 are grounded and pin 9 is at +5V, giving a preset count of 8. The remaining parts of the number N are set into IC 16 and IC 17 by either the memory or the scanner. In transmit, pin 1 of IC 19 goes low and pin 10 goes high presetting IC 19 to 5. The CHANNEL A MHZ switch then sets IC 18 to the desired megahertz.

If the VCO input to the divider chain was low enough in frequency no other circuitry would be required. Above 4 MHz or so, the propagation delay through the four dividers becomes considerable. When this happens an extra cycle or two may slip by before the chain reloads for the next count down. The result would be division by 3601 or 3602 when N is set to 3600. To prevent this, the loading of the number N is begun two cycles before the end of the count down. For 146.22 transmit the proper N is 5622. Each cycle from the VCO causes the number to drop by one. Eventually IC 17, IC 18, and IC 19 will reach a count of zero. Then, when IC 16 counts down to 2 (0002 in the divider), all inputs to IC 20 (pins 1, 2, 4, 5) are high. This causes pin 6 of IC 20 to go low. That point is also the data input to IC 22, a D-type flip-flop. On the next VCO cycle, pin 5 of IC 22 goes low, grounding the LOAD inputs of all 74192 dividers (pin 11). This forces the original count (5622) in to the divider chain. At the same time that pin 5 of IC 22 goes low pin 6 of the flip-flop goes high. On the next VCO cycle IC 22 sets (pin 5 high, pin 6 low). The output of the divider (IC 22, pin 6) therefore goes high for one half cycle of the VCO frequency once every 5622 counts (or N counts). This output is difficult to see unless you have an oscilloscope with at least a 10 MHz response since its width is typically 125 nanoseconds or so and it occurs only once in about a millisecond.

TT Pad Switching

Fig. 4 shows the wiring of the OPERATE--PROGRAM switch. It is largely a matter of disconnecting the seven switches from the pad and connecting them to the encoder. Tone decoder ICs could be used here but at much greater expense.

I have shown the actual color-coding found on my standard pad. One of the auxiliary switches, normally closed, is used along with the button switches. Only six of the switches are actually used. The *, 0, and # are not encoded. Since a zero equals 0V on all lines, there was no need to encode this button. The special symbols have no meaning in the programming routine and are not used. They all will store in memory as 0. I have labelled the switches on the pad for

ease in identification. The column switches are labelled A, B and C. The row switches are labelled 1, 2, 3 and 4. For example, pushing a 1 causes switches A and 1 to close (and opens the auxiliary switch). The auxiliary switch is labelled R because it is used to reset the bounceless pushbutton flip-flops.

The switch used to connect the pad to the BCD encoder was a multiple-wafer 12 PDT rotary switch. Contacts are provided for applying +12V to the pad for normal operation. The transmitter is also disabled by the switch during programming operations. Audio from the pad is applied in parallel with the mike through the attenuator network shown.

BCD Encoder

The awesome looking layout in Fig. 5 is the BCD encoder. I have shown the TT pad wired directly to the encoder for simplicity and clarity. IC 1 – IC 3 are used as bounceless pushbuttons to eliminate false data caused by the mechanical bouncing of the pad switches. IC 4 through IC 10 detect which two switches on the pad are closed and set the proper BCD output lines low. The output lines are inverted. That is, when a 2 is pushed the BCD equivalent in 0010. The output of the encoder is not 0010, but 1101. This is indicated by the bars over the symbols. Another inversion takes place in the system before the number gets stored.

Note that there are also outputs from the A, B and C switch encoders. These lines are also inverted. For every button pushed, one of these three lines must go low. This flag is used to tell the clock generator that a TT pad button has been pushed; the BCD outputs tell the memory which button it was.

Clock Generator

The clock generator, shown in Fig. 6, is one of the more interesting circuits. It provides any preset number of pulses as desired.

The clock generator is started when one of the TT pad buttons is pushed while in the PROGRAM mode. The A, B and C inverted outputs from the BCD encoder go to IC 25a. When any one of them drops low, pin 6 of IC 25a goes high and remains high so long as the button is depressed. On the high to low

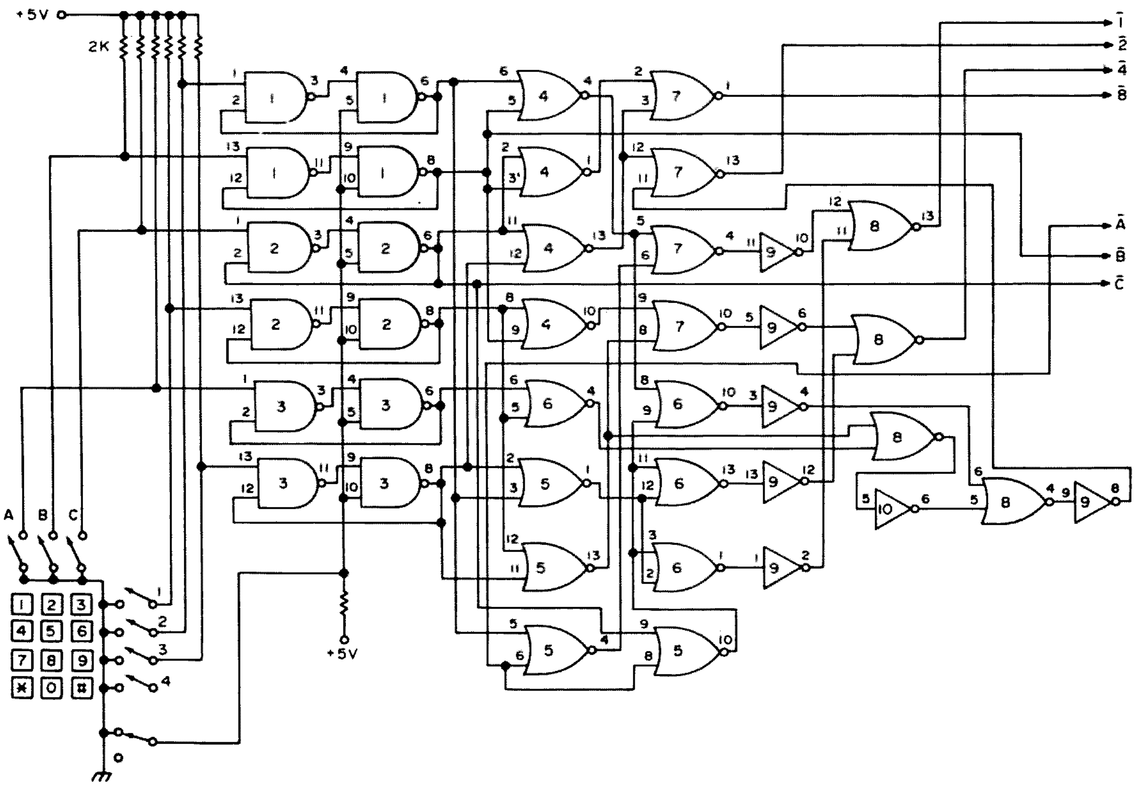
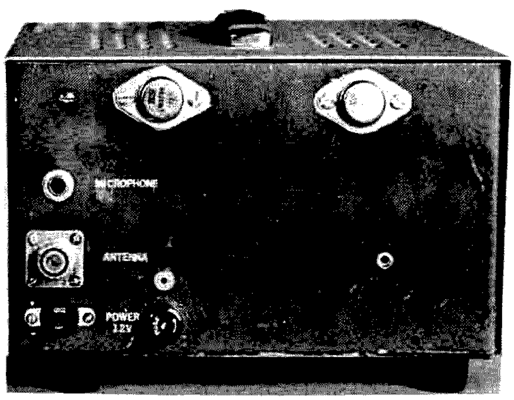


Fig. 5. BCD Encoder. IC numbers are shown on each logic element. The bars over the numbers and letters indicate inverted logic states. The Operate-Program switch is not shown here.



Rear view showing the connectors for power, antenna and microphone. The two LM309 regulators were mounted after scraping away enough paint to get good thermal contact with the chassis.

transition, a one-shot multivibrator IC 33 triggers for 25 milliseconds, storing the number in a quad latch, IC 34. At the same time, one-shot multivibrator IC 35 triggers for 150-200 milliseconds. Its output goes high for that length of time. At the end of the 150 ms pin 6 of IC 35 goes low. One of the places this signal goes is to another data selector made up of IC 30c, IC 29b, c and d. In the PROGRAM mode, this selector connects the output of IC 35 to the MODE inputs of the 7495 shift registers in the memory. When IC 35 goes high, then low, it selects right shift (parallel input) in the 7495 ICs. In the operate mode, the selector connects the MODE line to the output of IC 32a which determines left or right shifts as explained later. The output of IC 35 also goes to a second data selector consisting of IC 14b, c and d. In the PROGRAM mode this selector causes the P/S converter to load the BCD number from IC 34 as IC 35 makes its high to low transition. Later in the sequence the selector connects the P/S converter to the clock generator (which shifts the BCD number into the first memory slot. In the operate mode this data selector connects the P/S converter mode control directly to the clock generator.

So far all of the control lines have been explained, but nothing has been said about the clock generator itself. The output of IC 35 is also connected to inverter IC 26a. Its output is differentiated by an RC network, producing first a negative pulse and then a positive pulse. On the input of the positive pulse pin 4 of IC 23b goes low for the duration of the pulse. The negative transition of IC 23b causes the clock control flip-flop IC 24a to preset (Q output pin 15 goes high and remains high). This initiates (at long last) the clock generator sequence. Flip-flop IC 24b along with IC 31a make up a "ones-detector." This part of the circuit was found in "Designing with TTL Inte-

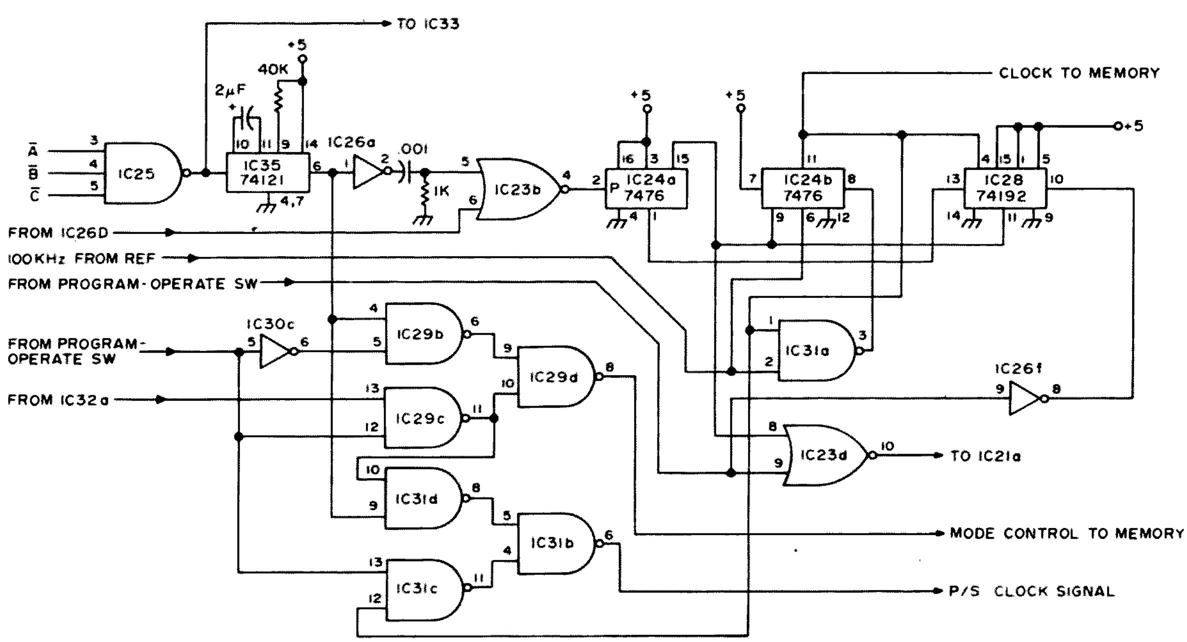


Fig. 6. Clock Generator. This circuit produces pulses for shifting the memory and inhibiting the transmitter during programming.

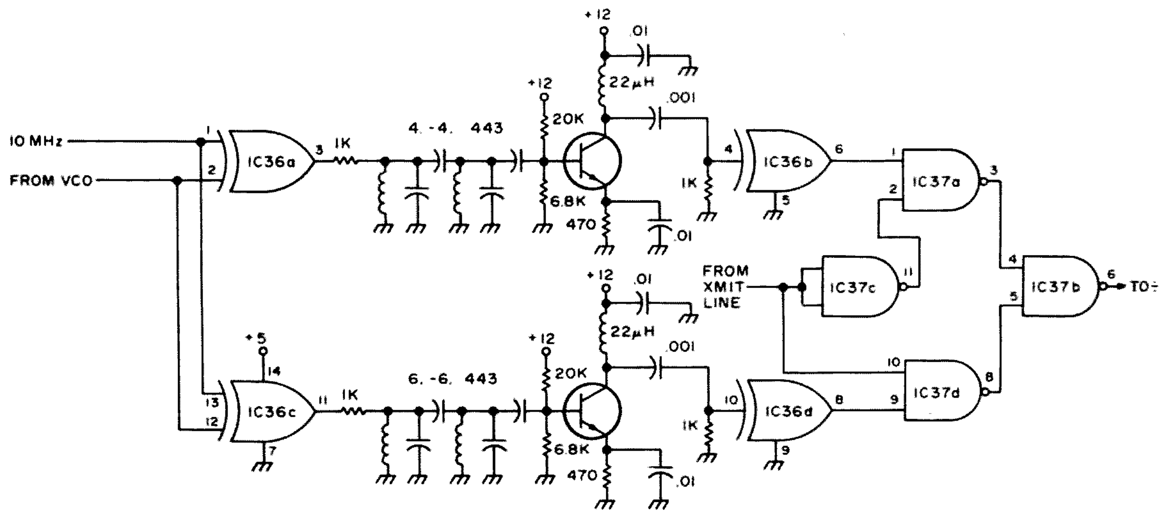


Fig. 7. Digital Mixer. A separate mixer and filter is provided for transmit and receive. IC37 is a switch to select the proper mixer output.

grated Circuits," one of Texas Instruments Electronics Series. A 100 kHz square wave feeds the clock input of IC 24b. This signal will appear at pin 11 of IC 24b so long as the J input, pin 9, is high. This arrangement allows integral numbers of cycles to pass through the "ones-detector." The output of IC 24b, pin 11, goes to the memory as the shift clock signal. It also feeds a programmable divider, IC 28. In the PROGRAM mode, this divider is preset to count from 3 down to 0. When it hits 0, the borrow output (pin 13) goes low, clearing the control flip flop IC 24a. That in turn shuts off IC 24. Since IC 24b will not shut down in the middle of a cycle, four complete cycles of the 100 kHz signal go out to the memory and P/S converter. Those four cycles cause the loading of one BCD number into the memory and the shifting of the others. In the OPERATE mode, the divider is preset to count from 7 down to 0, giving an output from the clock generator of 8 pulses. This particular circuit can be used by itself as a N-pulse generator. The number of 74192 (or 74193) programmable dividers can be increased to give any number of output pulses on a one-time basis.

The circuit is self-loading. That is, the number of pulses to be generated is loaded into the 74192 each time IC 24a resets (at the end of each shift). The gating line from pin 15 of IC 24a also goes to a NOR gate, IC 23d. Pin 10 of IC 23d goes low whenever the clock generator is causing a memory shift. This low signal is used in inhibit the transmitter.

Digital Mixer

The VCO output frequency is just a little too high for reliable counting in my programmable divider, so I used a heterodyning method to lower the input frequency to the 74192 chain. As shown in Fig. 7, the mixer itself consists of a 7486 exclusive OR gate, IC 36. The output of the exclusive OR with two signals on the input includes the sum and difference frequencies, plus many harmonics. To prevent confusion of the ÷N, separate mixers were used for transmitting and receiving. Bandpass filters are used to pass only the desired range of frequencies, IC 37a, b and c select the filter output. Q2 and Q3 are used to overcome the losses in the filters.

Memory and P/S Converter

The P/S converter and the memory were assembled using 7495 left/right shift registers. As shown in Fig. 8, seven of these ICs are used. The first, IC 38, is used as the P/S converter. The BCD number from the TT pad enters the P/S converter through IC 34, a 7475 quad latch. The data is temporarily stored in IC 34 when IC 33 triggers. Pin 6 of IC 33, a 74121, is normally low. When a TT pad button is pushed pin 6 goes high for 25 milliseconds or so. This causes the data to enter IC 34. When pin 6 goes low again the latch holds the data that was

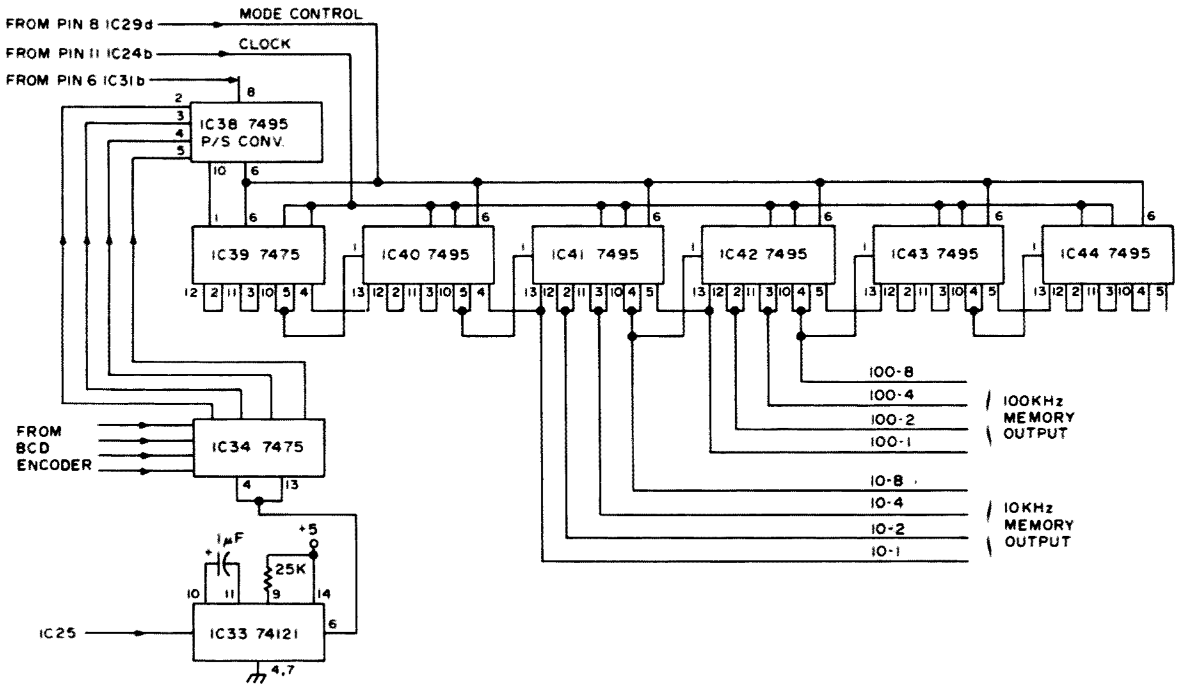


Fig. 8. P/S Converter and memory.

present at its inputs when the negative transition occurred. The output from IC 34 is taken from the $\overline{Q}$ pins, providing the inversion necessary to give true BCD coding of the decimal number into the memory. At this point in the chain the BCD numbers will have the coding found in Table 1 (Oct. 1974).

The data enters the P/S converter at the parallel inputs. The 7495 can be used for several functions. When pin 6 is high (Mode control), parallel-in, parallel-out operations may be performed. The data present at pins 2, 3, 4 and 5 are transferred to the outputs (pins 13, 12, 11 and 10) on each pulse of the CLOCK 2 input (pin 8). Shift left can be implemented in this mode by connecting

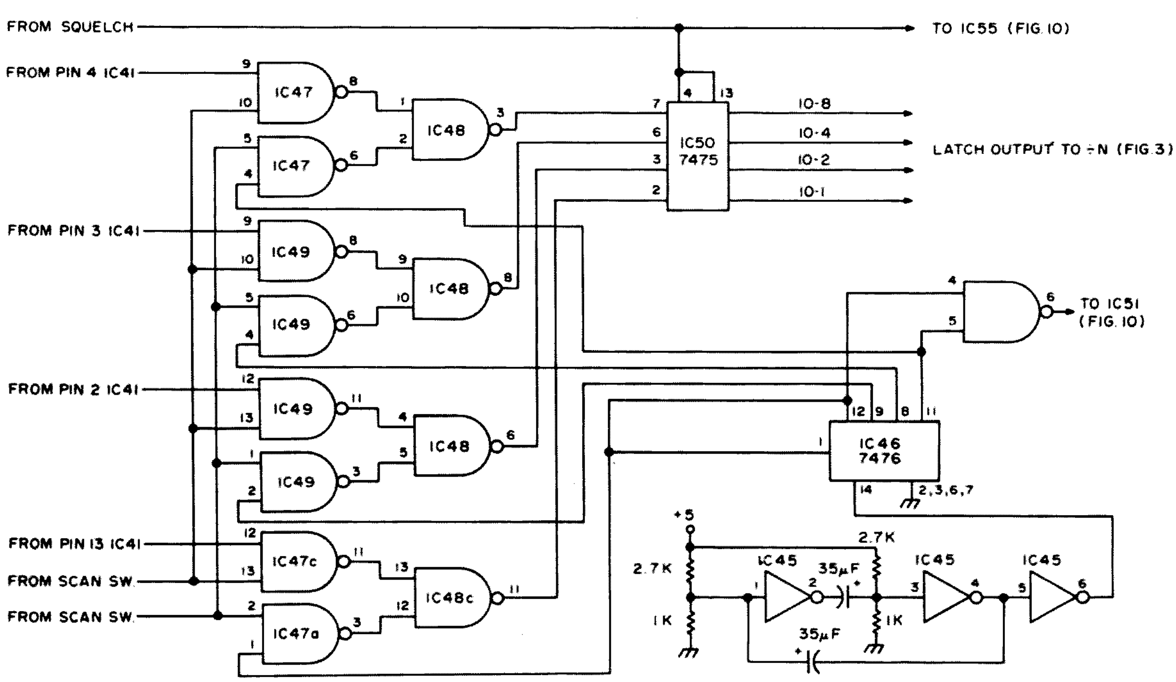
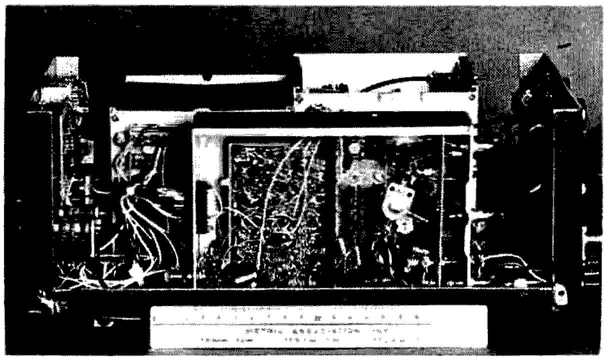


Fig. 9. 10 kHz Latch. IC47, IC48, and IC49 for a data selector to connect either the memory or the scanner to the ÷N.

each output to the parallel-input of the preceeding flip flop (pin 10 to pin 4, pin 11 to pin 3, etc.). Serial data would be entered at pin 5. Shift-right operations are performed with the mode control pin 6 low. With each CLOCK 1 pulse data is transferred from one flip flop to the next flip flop down the line. Serial data is entered at pin 1 in this mode. IC 38 is used for parallel-in, shift-right operations only (parallel in to serial out). It accepts the data from the quad latch in parallel format, then shifts right on each of the four pulses from the clock generator. This moves one BCD number serially into IC 39, the first memory slot. IC 39 through IC 44 are wired for both left and right shifting operations. In the PROGRAM mode pin 6 of these six ICs is held low during the four clock generator pulses. The serial data from the P/S converter is loaded into each slot. In the OPERATE mode the mode control pin 6 changes depending upon the position of the CHAN REV switch. Normally, it is low for shifting right into the transmit frequency, and high for shifting left into the receive frequency. An exception to this is in SIMPLEX mode. Once set for either A or B channel simplex operation, the mode control signal is inhibited (does not change).

The output from memory is taken from



This side view clearly shows the HT-220 circuit board with the buffer/multipliers to the right. All circuit boards and other critical circuitry were mounted in shielded boxes.

the parallel outputs of IC 41 and IC 42. It should be obvious that with this shift register form of storage extra slots are necessary to save the data not currently being read out. That is the reason for 24 bits of storage with only 16 bits of data.

Scanner

The scanning circuitry is identified by two labels – the 10 kHz latch and the 100 kHz latch. The two parts are very much the same. The 10 kHz latch is shown in Fig. 9. Three sections of a hex inverter, IC 45, are used as an oscillator with constants fixed for a frequency of roughly 10 Hz. This oscillator

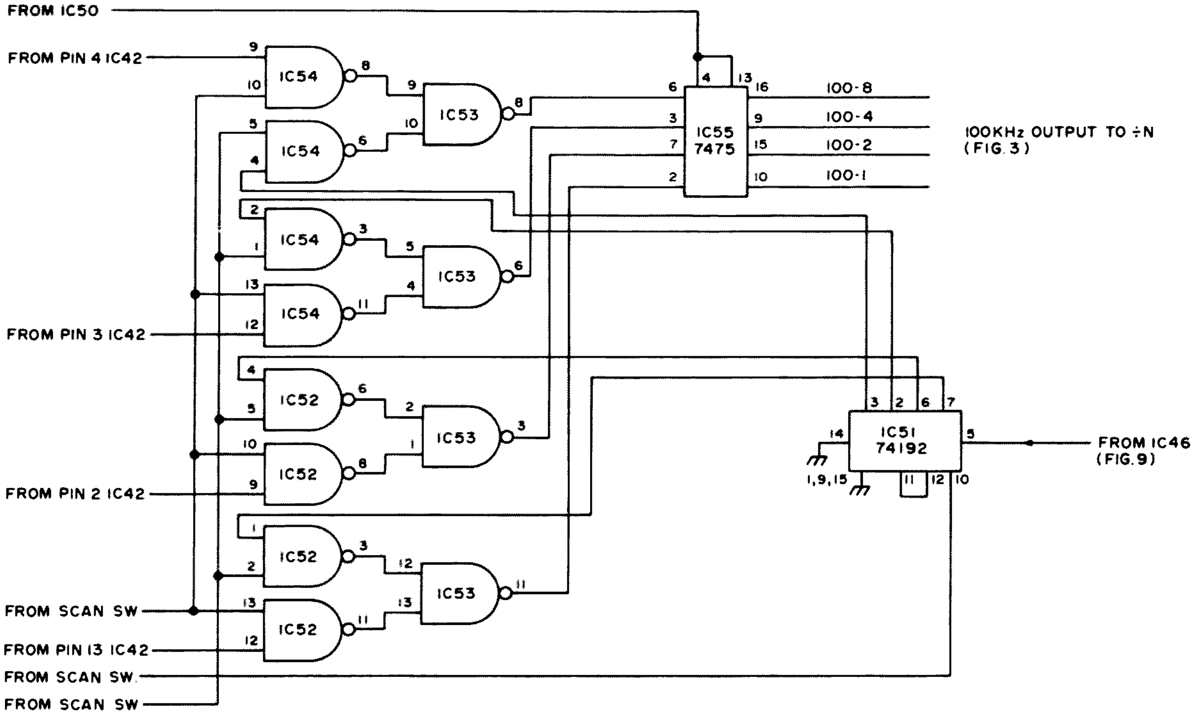


Fig. 10. 100 kHz Latch. Circuitry is the same as the 10 kHz latch with the exception of IC51.

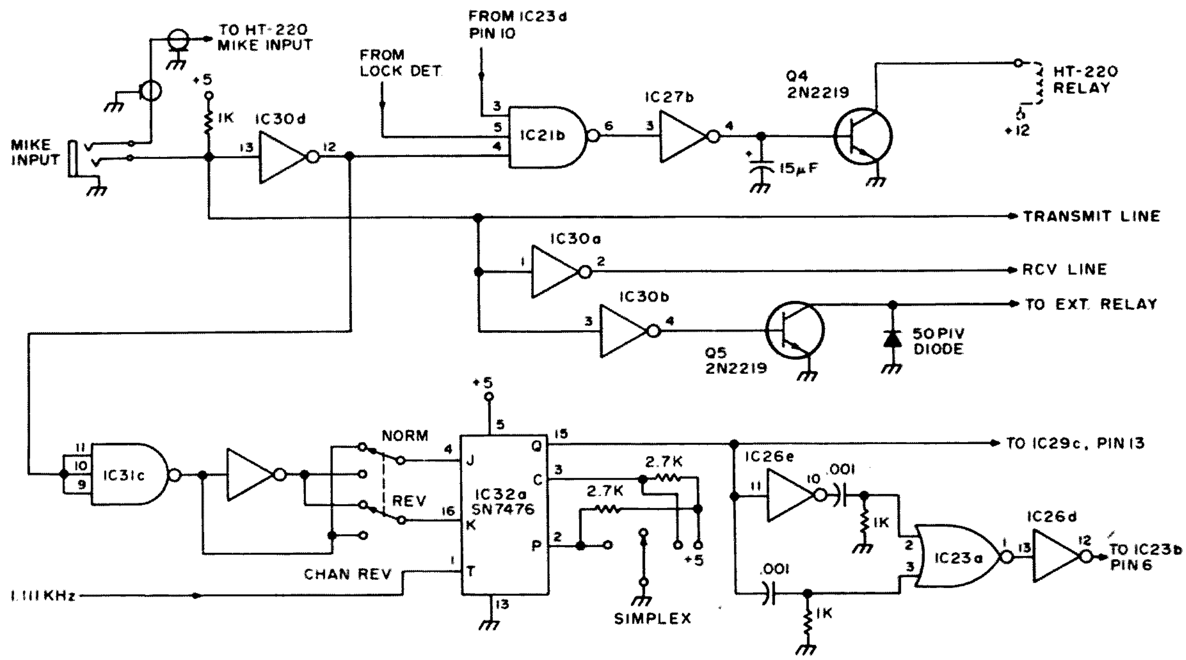


Fig. 11. T/R Logic. Transmitter keying, channel reversing, simplex, and memory control are controlled with this circuitry.

drives IC 46, a 7490. IC 46 and its companion IC 51 (74192) constitute a ÷100 or ÷50 chain. IC 46 is wired for BCD counting. Its outputs follow exactly the sequence found in Table I and are used in place of the memory outputs for scanning in 10 kHz steps. IC 47, IC 48, and IC 49 form another data selector. The operation of only one section will be described since the concept remains the same for all such selectors in this rig.

The 10-1 line (BCD 1 portion of the 10 kHz section) is switched by IC 47a, IC 47c, and IC 48c. When the SCAN switch is set to OFF pin 13 of IC 47c is high and pin 2 of IC 47a is low. Since IC 47 is a quad NAND gate pin 3 will remain high regardless of the state of pin 1 (because pin 3 is low). Pin 11 of IC 47c will be low when pin 12 is high and vice versa. The total action just described can be summed up by saying that a NAND gate becomes a simple inverter if one of its inputs

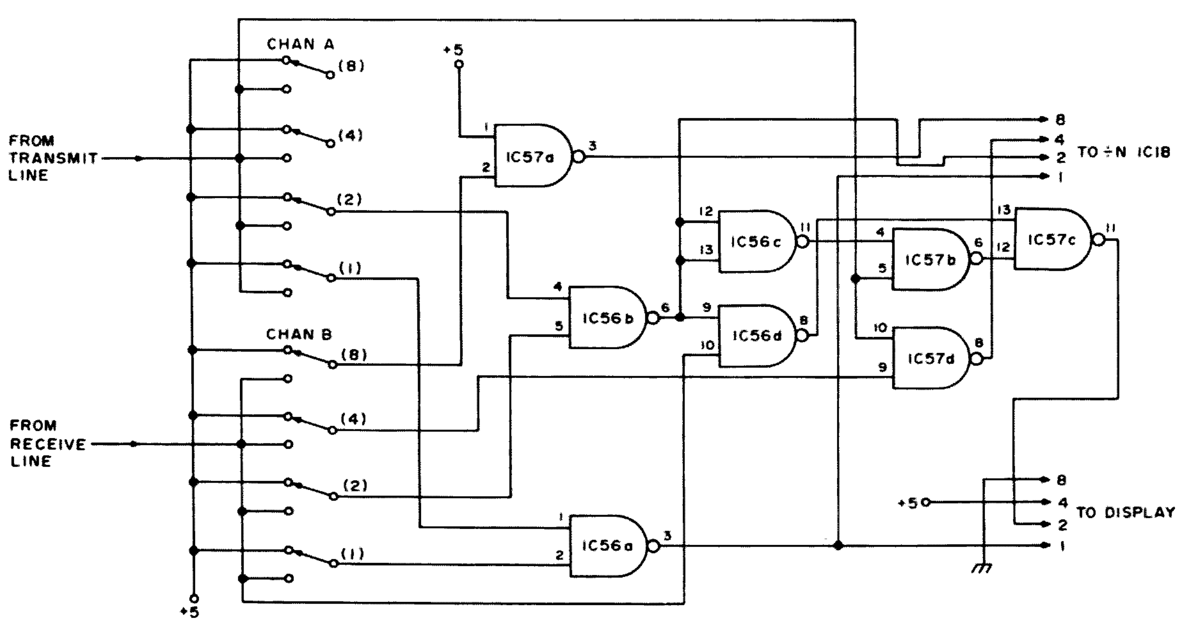
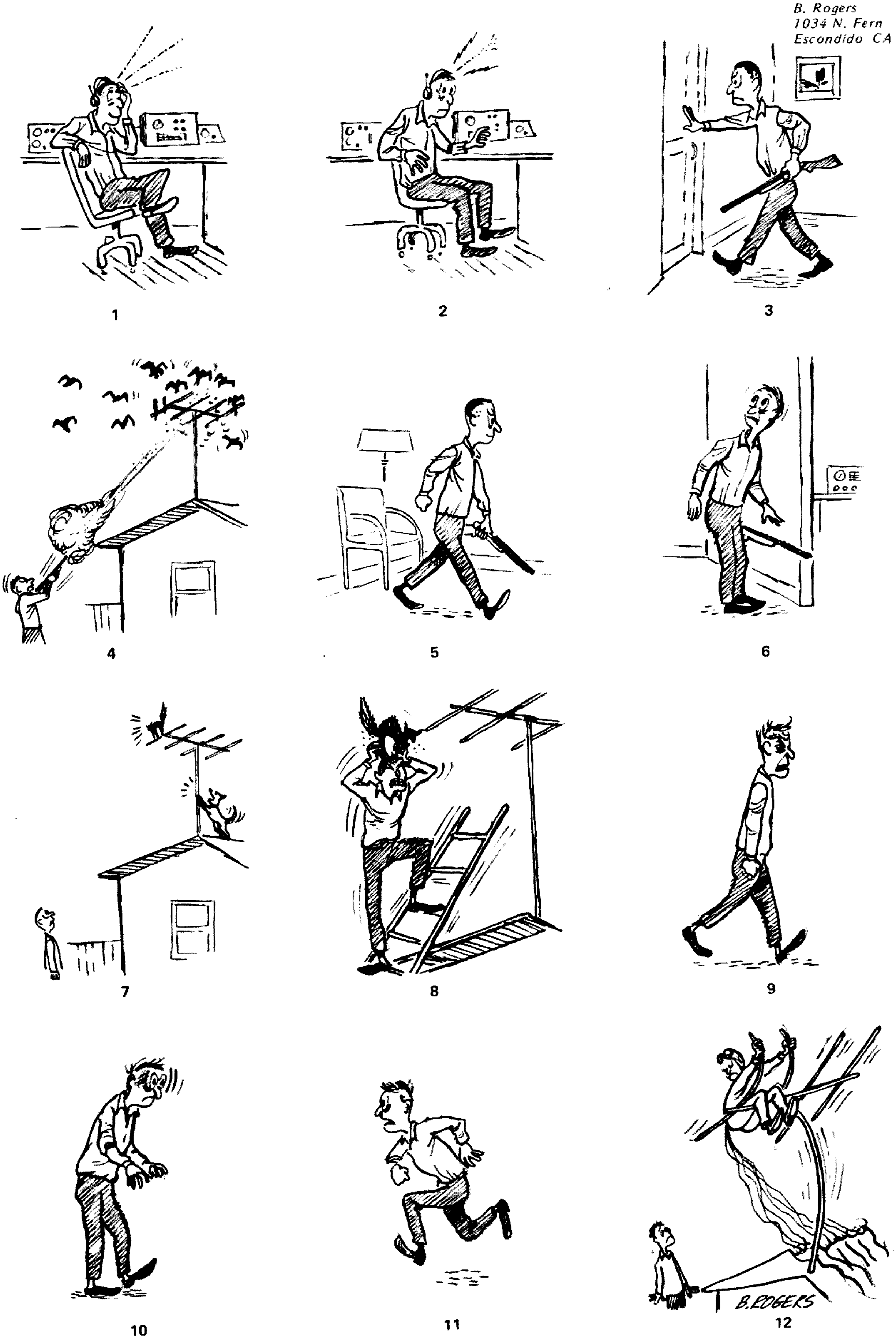


Fig. 12. 1 MHz Switching. This circuit provides the front-panel selection of the 1 MHz range setting for proper display during receive.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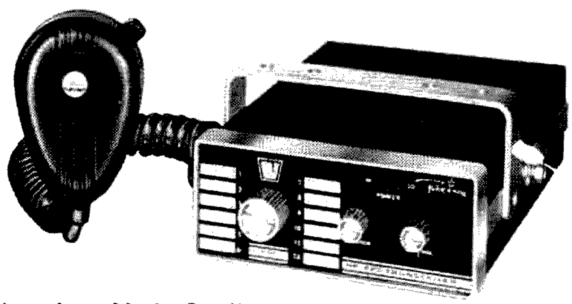

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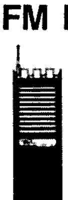

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HR-2MS
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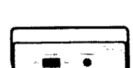
2 Meter FM Transceiver



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is held high, and becomes inactive if either of its inputs is held low. IC 48c acts as an inverter all the time. Pin 12 of IC 48c remains high with the scan off, causing the output of the selector to follow the input at pin 12 of IC 47c. No inversion occurs through the selector. When the scan is turned on the output of the selector at pin 11 of IC 48c follows the input of IC 47a. That input is the 10-1 line from the 7490 BCD counter.

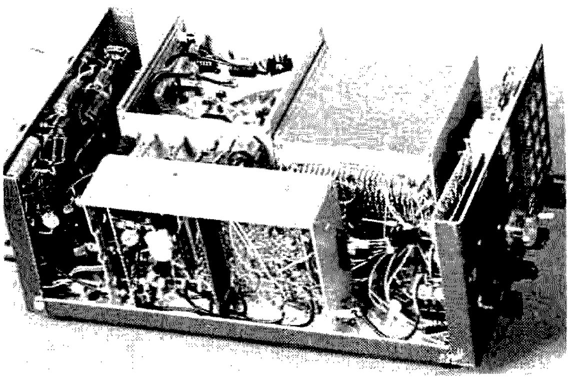
This data selector can be very handy in other applications since its switching time is limited only by the propagation delay within the ICs (in nanoseconds). The particular one used here is an 8 PDT switch. Using NAND gates to synthesize the selector was less expensive than buying a single IC data selector.

The output from the data selector goes to the quad latch, IC 50. Its clock inputs (pins 4 and 13) are normally held high and the outputs follow the inputs. The clock inputs drop low, freezing the data in the latch, whenever the squelch opens or the transceiver is in the PROGRAM mode.

Fig. 10 shows the 100 kHz latch. The data selector and latch are the same as just described. The counter in this case is a programmable up down counter, IC 51. It is wired to count up from the preset input. The setting of the SCAN switch determines where it begins to count. It is preset to 0 for an entire megahertz scan and to 5 for just the top half of a megahertz. It increases by one with every tenth count of the oscillator.

T/R Logic

The transmit receive switching is reasonably simple. The PTT line in Fig. 11, is isolated from the T/R logic by an inverter IC 30d. The inverter will cause the HT-220 relay to close on transmit through IC 31b and IC 27b if the Unlock Detector output and the Transmit Inhibit lines are both high. If PLL lock is not achieved pin 5 of IC 31 goes low, preventing transmitter keying. The same is true when the clock generator is running (pin 3 of IC 31 drops low). The "XMIT LINE" signal is inverted in IC 30a and becomes the "RCV LINE." These two lines provide logical "0" signals during transmit and receive respectively. Keying an



Tne HT-220 board and the buffer/ multipliers are mounted in the box in the foreground. The two other boxes house all other circuit boards. The open box at the upper right holds the reference oscillator, phase detector, VCO and digital mixer.

external relay is possible using IC 30b and Q5.

Memory shifting during transmit and receive and during channel reversing is accomplished primarily with a J-K flip flop, IC 32a. IC 31c is in the line to the J-K flip flop for no other reason except to put it to use. Power requirements are reduced just a bit by connecting unused inputs to used inputs or to +5V on TTL chips. The J-K flip flop is clocked by the 1.111 kHz output of the ÷9000 chain. In the NORM position of the CHAN REV switch the J input is high and the K input is low. This forces the Q output high on the next clock pulse. With Q high (pin 15) the memory is set for a shift-left. When the PTT button is pushed the J input goes low and the K input goes high. On the next clock pulse this J-K data input causes the Q output to drop low and stay there regardless of the clock input. The mode control to the memory is therefore low, commanding a shift-right operation. The negative transition of the Q output is differentiated and inverted in IC 26e, IC 23a and IC 26d. The output of IC 26d is a short pulse (positive going). Since it is connected to IC 23b (Fig. 6), this pulse causes the clock generator to start feeding pulses to the memory. When the PTT button is released, J goes high (K goes low), programming a shift-left in the memory. Because of the wiring of the differentiator and inverter any change in the mode line causes the clock generator to start. Therefore, the memory

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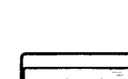
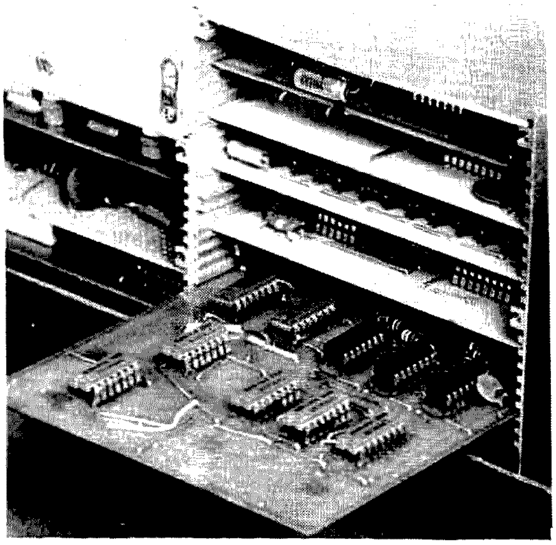


AR-2
2 Meter FM
Power Amplifier



The individual circuit boards plug into sockets in the shielded enclosures. Troubleshooting and circuit testing is simplified using a board extender. The board shown extended is the BCD Encoder board.

shifts left when the PTT switch is opened.

Channel reversing is simply a matter of convincing IC 32a that the PTT switch has been pushed when it hasn't. This is done by reversing the data into the J-K inputs. The contact bounce in the reversing switch causes many, many shifts to occur, but since each shift requires only 80 microseconds this is not noticeable. I have never observed a lost bit or incorrect shift due to this bouncing.

Simplex operation is obtained by holding IC 32a in either the set or preset condition. If the SIMPLEX switch is moved so that the Clear input (pin 3) is grounded, the Q output drops low and remains so until the Clear input is high once again. That is, it remains low regardless of the clock and J-K inputs. The Q output is set permanently to a 1 if the Preset input is grounded. In this way, the memory cannot shift when the PTT switch is closed and opened and simplex operation is achieved.

1 MHz Switching

The 1 MHz portion of the ÷N programming is selected by two panel mounted switches. Although ordinary rotary switches and a diode matrix may be used for this (thumb wheel, too), I was fortunate to find in surplus some rotary switches with BCD output. Each switch had four micro-switches ganged together and operated from a camming surface to give BCD encoding of the rotary motion. These are shown in the wiring diagram in Fig. 12. The CHANNEL A MHZ switch is selected during transmit and the CHANNEL B MHZ switch is used during receiving. This circuitry also subtracts 2 from the CHANNEL B MHZ switch setting. This is necessary since an 8 must be set on the switch to receive 146 MHz signals and it is desirable to display a 6, not the 8.

A computer-type circuit could have been used to subtract 2 from the receive setting. Full adders such as the 7483 could be used and were tried. I saved some circuitry and

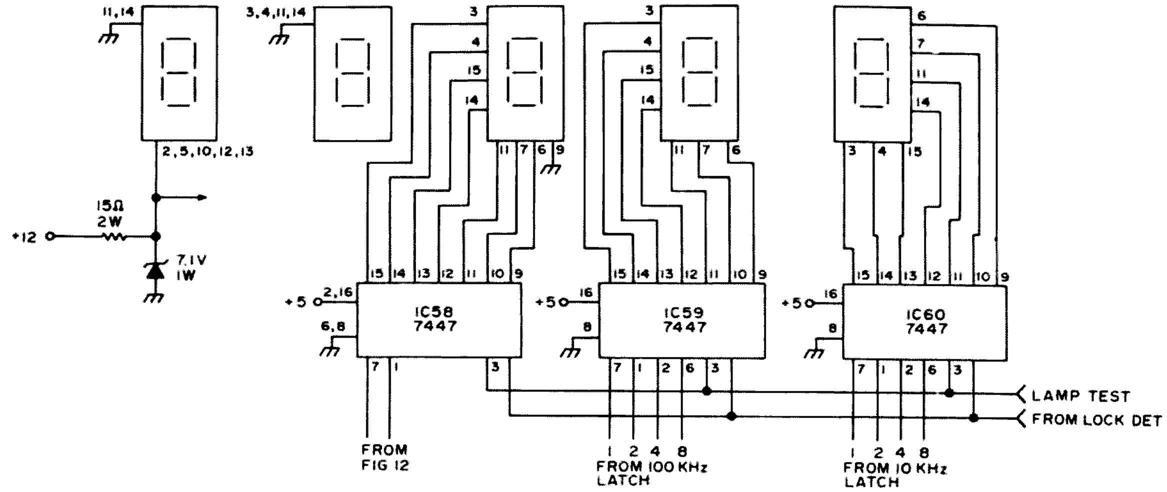
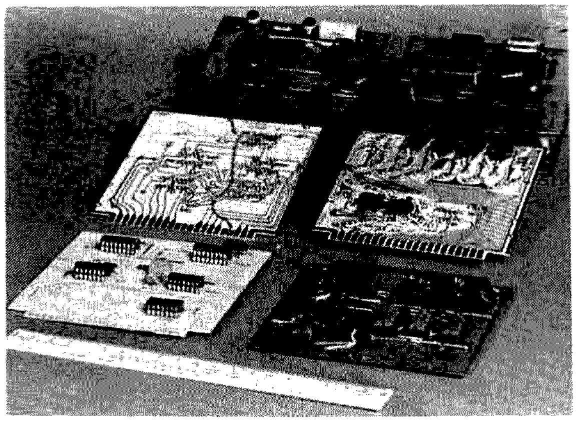


Fig. 13. Digital Display. All Minitrons have pins 2, 5, 10, 12, and 13 connected to 7 Vdc. Pin 9 is grounded on the center Minitron to provide a decimal point.

expense, however, by noting that this is a very special case. I had to subtract 2 only from the numbers 6, 7, 8 and 9. Table II lists the settings of the CHANNEL B switch for each step in the 2m band. Also listed are the BCD numbers that I wanted to display. Note that in the 1-columns of both numbers each bit is the same. I made no changes to the 1000-1 line (1000 kHz 1 line). Note also that the 2-columns are just the inverse of each other. For this line I simply inverted the output from the CHANNEL B switch during receive. The 4-column of the desired display is always a "1" and the 8-column is always a "0." This was easy to implement by permanently wiring the display input for a "1" on the 1000-4 line and a "0" on the 1000-8 line. IC 56 and IC 57, both 7400 NAND gates, create this very special "subtract 2" circuit. This one will not work for numbers other than 6, 7, 8 and 9.

Digital Display

The five digit display uses five Minitron seven-segment read-outs with three 7447 seven-segment decoder-drivers. Fig. 13 is the schematic of the display. The power for the Minitrons was taken from the 12-15 VDC source through a zener regulator circuit. With only 5V on the Minitrons, the display could not be read in sunlight. 7V makes the display easily readable and does not exceed the maximum of 9V. The lifetime of the filaments must be derated but I have no information regarding this. The 14 of 14X.XX is permanently wired into the display, reducing the number of 7447's required. The three 7447 ICs that are used are blanked when an out-of-lock condition occurs.



Most of the circuitry was done on printed circuit boards. Six of the boards are shown here. Starting at the top, left to right, the boards are the T/R board, 10 kHz latch, 100 kHz latch, Memory, Clock Generator and BCD Encoder.

Frequency	CHANNEL B MHZ				Displayed BCD Number			
	8	4	2	1	8	4	2	1
144.00	0	1	1	0	0	1	0	0
145.00	0	1	1	1	0	1	0	1
146.00	1	0	0	0	0	1	1	0
147.00	1	0	0	1	0	1	1	1

Table II

Squelch Circuitry

The squelch hold circuitry is very simple. A 741 op amp is used as a voltage comparator. Its ouput swings rapidly between 0 and +12V as the squelch voltage from the 220 crosses a preset threshold. This point is adjusted by the setting of the 1K pot, R1. Normally, the signal from the 220 is near 0V. Under that condition, the output of IC 61 will be high (+12) because the inverting input is greater than the non-inverting input. R2 and R3 form a voltage divider to keep

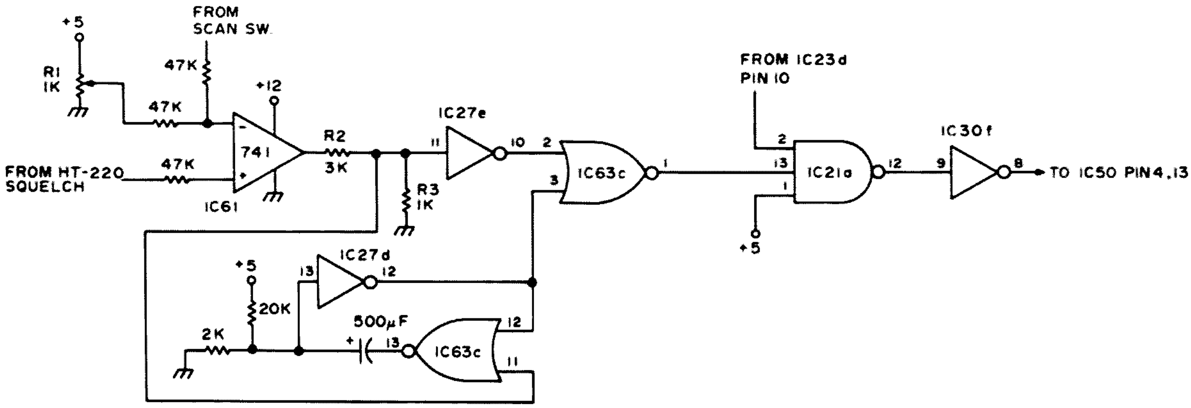


Fig. 14. Squelch Hold. R1 sets the threshold sensitivity.

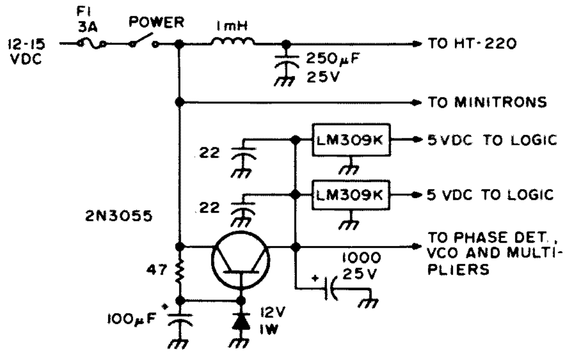


Fig 15. Power Supply.

the input to the TTL chips less than 7V. With the multiple inversions in IC 27e – IC 30f, the output of this squelch hold circuit is high (+3) when the HT-220 receiver is squelched. Since this output is the clock for IC 50 and IC 55, the latches do not hold the frequency. When a carrier is encountered the latches freeze the data. IC 27d, IC 63c and IC 63a form a one-shot multivibrator which is triggered by the disappearance of the carrier. It holds the latches in the "frozen" state for about three seconds after a carrier drops out. This allows you to listen to both sides of a conversation even though one side may be slow picking up the mike. This 3 second delay must be eliminated when not scanning, otherwise the time required to go from receive to transmit would be 3 seconds. This inhibiting mode is accomplished by setting the threshold in the 741 op amp much higher when not scanning. The squelch signal from the 220 can never reach it. A second input to the inverting input is activated when not scanning (raised to +5V).

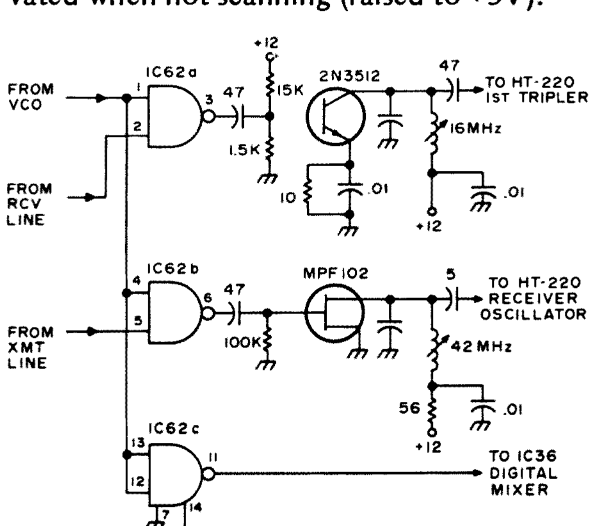


Fig. 16. Buffer/Multiplier.

Power Supply

The transceiver was designed to operate from 12-15 VDC. The HT-220 board works better near the high end of this range, although I have experimented with it and can go as low as 11V with mine. The +5V for the IC packages is supplied by two LM-309K regulators mounted on the rear of the cabinet. The TTL load is evenly split between the two. A separate LM309H was used for the VCO and was mounted on the board with the oscillator. To keep ignition noise out of the rig and to provide more stable operation, the +12 regulator from K2OAW's article was also used. Fig. 15 shows the power system.

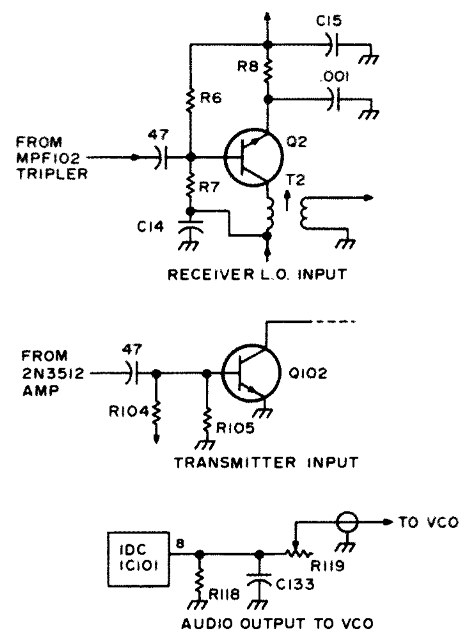


Fig. 17. HT-220 Connections. These connections are just one method for mating the synthesizer to the HT-220.

Buffer/Multiplier

The output of the VCO is buffered first by IC 62, a quad-NAND gate. One section is used to drive the digital mixer. Two more sections are used as switched amplifiers to drive the transmit buffer and the receive tripler. A 2N3512 was used as a buffer to drive the first tripler stage of the HT-220 transmitter. The 14 MHz output is tripled in an MPF102 stage before going into the receiver oscillator stage of the 220. These stages are right out of the Bandbook and are shown in Fig. 16.

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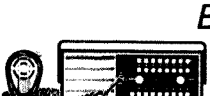
HR-2MS
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HR-212
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AR-2
2 Meter FM
Power Amplifier

HT-220 Modifications

My method of feeding the 220 board may not be the best or only way but it works well. If you are contemplating a rig like this one, I recommend that you acquire both a transmit and receive crystal for the HT-220 and get it tuned up and working to your satisfaction. I modified the original board for 2m operation with information from another article ("The 220 Amateur FM Rig," rpt. . .,September, 1971). In addition to the padding and audio modifications, I made some of my own changes. The transmit oscillator circuit was removed entirely and the input was connected directly to the base of the first tripler. The receiver oscillator was changed by disconnecting the "rubbering" circuit and bypassing the emitter of the transistor with a .001 μf disc capacitor. The 42 MHz input was connected to the base of the original oscillator. The coupling capacitor from the audio IC was connected to a shielded line and run to the VCO board. The squelch signal was taken from the base of Q12, the first audio amplifier. I was optimistic and mounted an S-meter on the FS-220, but up to this time I have not succeeded in coming up with a suitable means of driving it from the 220. A discriminator meter was easily wired in, however. Fig. 17, shows the connections made to the HT-220. A schematic is not given since so many different versions of this little rig exist.

Mechanical Work

The cabinet for the FS-220 was formed from a piece of aluminum 3mm thick. Starting with a piece 59.2cm by 24.3cm and bending as in Fig. 18, gave a cabinet size 21.6cm wide, 12.7cm high, and about 33cm deep. The top cover was bent from another piece of 1.6cm stock. The holes in the main chassis were punched before bending. Before painting, the chassis was etched in a lye bath and coated with zinc chromate. Several spray coats of blue enamel and some white lettering finished the job.

I said in the first part of this series that this was not a construction article. I meant that I did not think anyone would copy it

bolt for bolt. With all parts purchased new, rather than relying on surplus and several years worth of junkbox material, the cost of this transceiver would be high. It is certainly not necessary to have all plug-in boards enclosed in Vector EFP modules as I have done. Furthermore, my method of construction makes for much wasted space, but that is the way I wanted it on a prototype such as this.

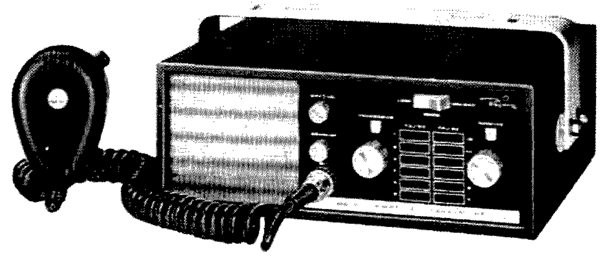
Results

This rig has been operational for several months. It is a real joy to have around. I have discovered repeaters in the south-west Ohio area that I never knew existed. On trips the FS-220 has provided many hours of enjoyment without worry about being "crystalled up" as I have so often heard mentioned. I don't carry my repeater direc-

IC #	Type	IC #	Type
1	7400	34	7475
2	7400	35	74121
3	7400	36	7486
4	7402	37	7400
5	7402	38	7495
6	7402	39	7495
7	7402	40	7495
8	7402	41	7495
9	7404	42	7495
10	7404	43	7495
11	7404	44	7495
12	7490	45	7404
13	7490	46	7476
14	7490	47	7400
15	7490	48	7400
16	74192	49	7400
17	74192	50	7475
18	74192	51	74192
19	74192	52	7400
20	7420	53	7400
21	7410	54	7400
22	7474	55	7475
23	7402	56	7400
24	7476	57	7400
25	7410	58	7447
26	7404	59	7447
27	7404	60	7447
28	74192	61	741 op amp
29	7400	62	7400
30	7404	63	7402
31	7400	64	LM309K
32	7476	65	LM309K
33	74121		

Table III
Integrated Circuit Types

Regency HR-212



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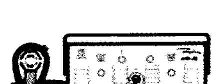

HR-6
12 Channel-25 Watts
6 Meter FM Transceiver

HR-220
12 Channels-10 Watts
220 MHZ FM Transceiver

HR-2MS
8 Channel Transcan
2 Meter FM Transceiver

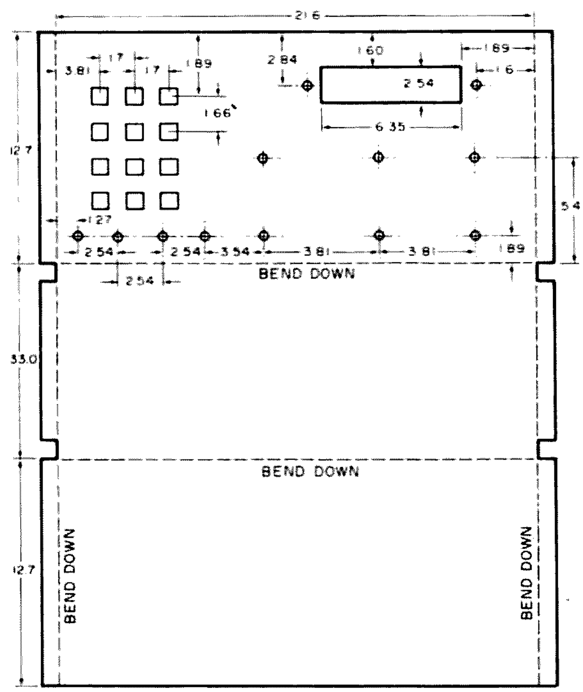

Fig. 18. The more important mechanical features are shown here to illustrate the technique used to construct the chassis (not to scale).

tory with me anymore. The scanner quickly tells me where the activity is.

All is not rosey, however. There are some draw backs to this rig (and similar synthesizers). If a repeater is encountered that is off frequency, you may be the only one who can't use it. So often the users "rubber" their crystals to match the repeater and then it doesn't matter what the frequency is, right? Good grief!

I have already considered modifications to this ultimate rig to improve it or make it more versatile. The VCO has some residual noise on it. The 1.111 kHz reference is still in there, but from reports it is apparently below the level of the alternator whine on many mobiles. I don't have my reference crystal in an oven and the warm-up time is too long on cold winter mornings (10 minutes). The next step is a read-only-memory (ROM), possibly reprogrammable, for all the standard FM frequencies. Scanning would then be faster and more efficient.

My thanks to the Dayton area FMers for tolerating the testing phase on this rig. Thanks also to WA8LSR for the photographic work on this article. Then there are the wife and kids, who put up with yet another construction project and occasionally left bits of food and drink at the top of the cellar stairs.

. . . W8KBC

RF HOT DOG

Using a neon to indicate the presence of rf is well known, and some amateurs are known to keep a neon near a tank, tuner, or end-fed antenna, watching it glow as they tune up. Unfortunately, a neon bulb by itself does not work well with weak rf.

The glowing nose of the "Hot Dog" is enormously sensitised by applying enough ac to get it started. In Fig. 1, each resistor is 3.3 MΩ. Electrically, both could be in one lead, or they could be at the neon end of the flexible cord. Having them at the plug end and taping them up inside gives a neater and safer piece of equipment for obvious reasons.

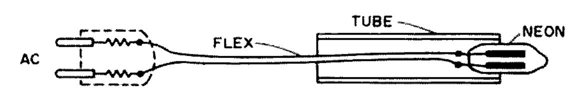

Fig. 1. This is all you need for a sensitive rf indicator.

The neon was a small one from a worn out soldering iron. Any neon will work, though the type with two small, nearly parallel inside electrodes (NE-2) seems best. The piece of insulated tube is only to cover joints and form a handle. Operation ought to be tried before finally sealing up the resistors. The idea is to use very high values, so that the neon barely glows with no rf nearby. The resistors need not be of the same value, and would be expected to be from 2 to 5 MΩ each.

The Hot Dog sniffs out rf like an ordinary neon, but responds to weak rf, either by a change in glow, or movement of the glow. It allows tuneup of weak or low-impedance rf circuits as well as showing rf hot spots and rf leaks in shielding.

. . .G3OGR

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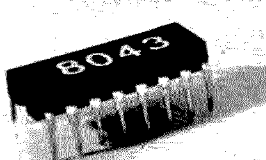
"WA9VLK DE W1IK – GE VERN NAME BILL BILL UR 559 RUTLAND VT RUTLAND VT – WHAT U MEAN NOVICE BANDS? NOVICES DWN HUNDRED KC – THIS IS EXTRA CW SEG NW – WX CLDY 34 DEGREES ES RIG EIGHTY WATTS TO DIPOLE – WATSA? WA9VLK DE W1IK."

"BK DE WA6ZDO."

"WA6ZDO DE WA9VLK – GE OM – NAME VERN VERN UR 599 KANKAKEE ILL KANKAKEE ILL BK"

"BK TNX VERN UR 599 DALLAS DALLAS – BILL IS 579 – NAME HR TOM TOM. UR OK VERN . . . THIS SEGMENT WS CHANGED BK TO GENERAL LAST THURSDAY BK"

CURTIS KEYER



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"WA9VLK DE W1IK – U OMS SHOULD READ MORE – ADVANCED AND UP GOT THIS SEGMENT YESTERDAY – GENERALS ARE 150 KC DOWN. ADVANCED AND EXTRA GOT UPPER 200 . . ."

"BK DE W3BYK"

"W3BYK DE W1IK HW?"

"W1IK DE W3BYK – LISTENING ES HRD U ALL DISCUSSING BAND CHANGES – NEW RULES THIS MORNING GAVE TECHS THIS SEGMENT – EXTRAS ARE UP 150, NOVICES GO 200 DOWN AND GENERALS ARE 250 DOWN HW? – W1IK DE W3BYK K"

"W3BYK DE W1IK – SRI OM FONE QRM – PSE TRY AGN BK"

"Break from WA2EWF"

"WA2EWF DE W3BYK – BETTER QSY OFF TECH CW SEGMENT BK"

"O.K. . . . (slurp, cough, hack) W3BYK from WA2EWF . . . helllllllllloooooooooo, o.k. . . . there we go . . . name here's baker ocean baker runnin' kay-dubya in Brooklyn. Just ah – heard you guys *down* on see-dubya, man, this segment is now extra phone since yesterday so you boys better get off the "For Extras Only" net frequency and get a current copy of QSD magazine. So back to Kankakee and Stern . . . WA9VLK *down* on cw from WA2EWF."

"WA2EWF DE WA9VLK – SURE DO WISH I KNEW WHO HAS THE SEGMENT NOW – WL 73 ES TNX – WA9VLK SK"

"WA9VLK DE W1IK 73 ALL CU AGN – W1IK SK"

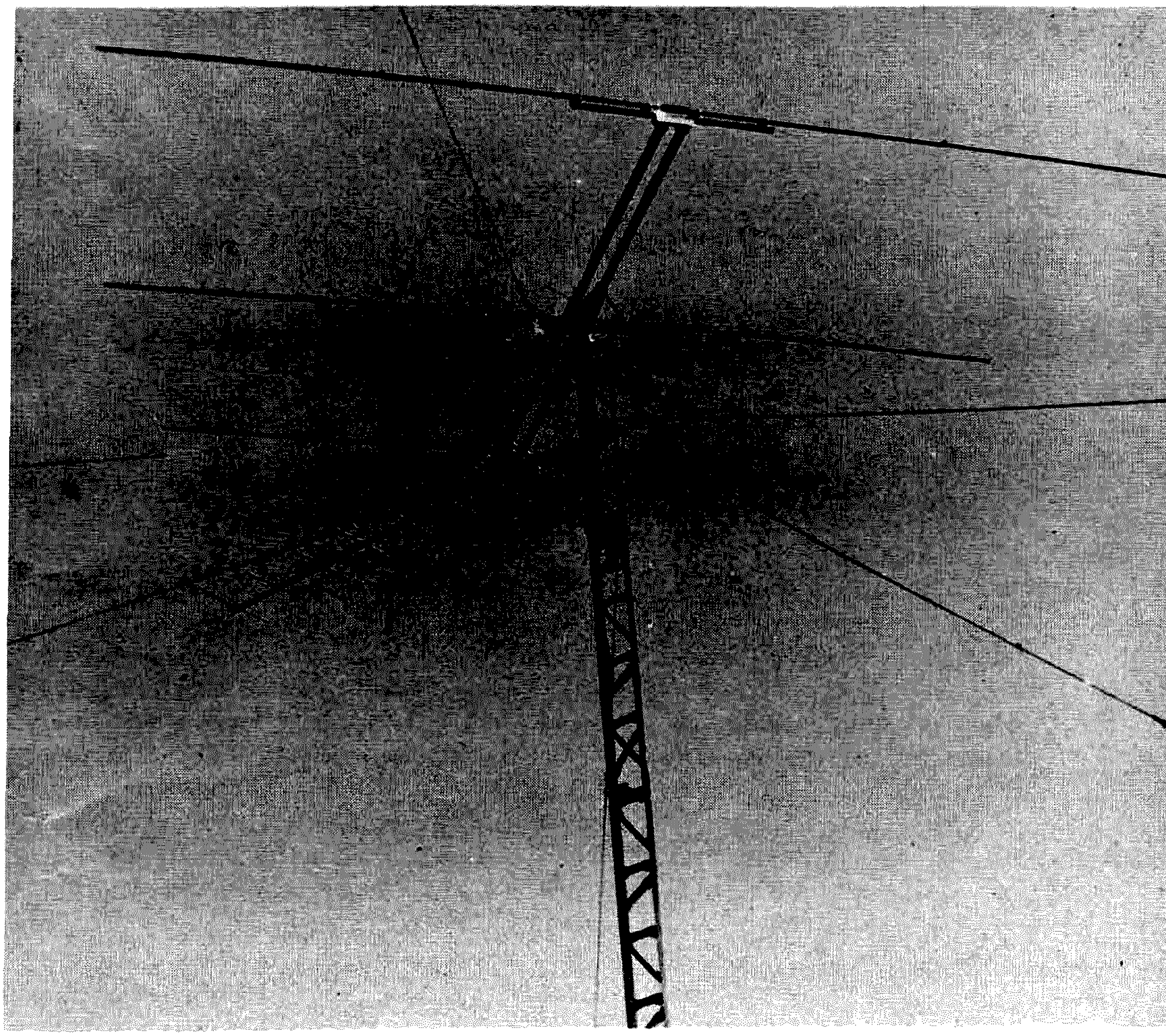
"BK 73 OMS W3BYK CL"

"Well . . . good luck all the way around, 73 – QR-Zed the FEO net from WA2EWF."

"WA2EWF DE WA6ZDO 73 ES HPE TO GET IT STRAIGHT GE DE WA6ZDO SK"

"KGX 2237 mobile to base . . ."

. . .WA9VLK.



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A Wind-Proof 20m Beam

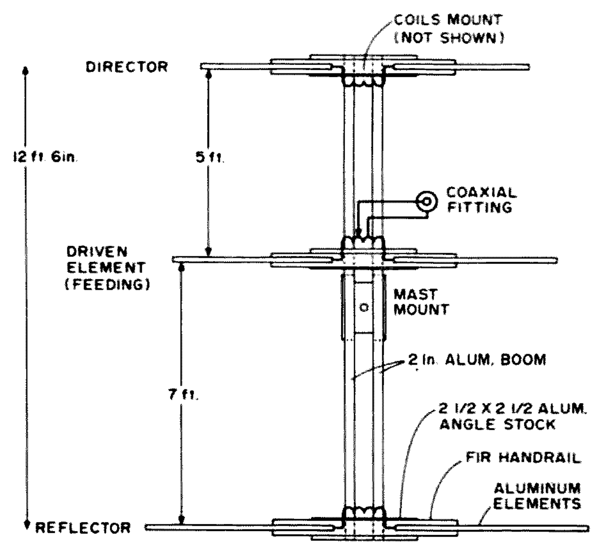


Fig. 1. Beam construction.

At my QTH due to regular windspeeds in excess of 110 mph, it was impossible to maintain a regular size 20m beam on the tower without it becoming damaged or broken.

So, if I wanted to operate on 20m with a rotating beam, I had to design a "windproof" version capable of withstanding such high windspeeds.

The local weather office windspeed gauges only read to a maximum of 110 mph and according to weather station records over the past dozen years or so, the maximum of 110 mph has been regularly recorded at least 3 or 4 times each year. Based on discussions I have had regarding wind problems experienced in other areas of the world (such as Hawaii), I am not the first ham to face severe wind problems in relation to the erection of a beam for 20m.

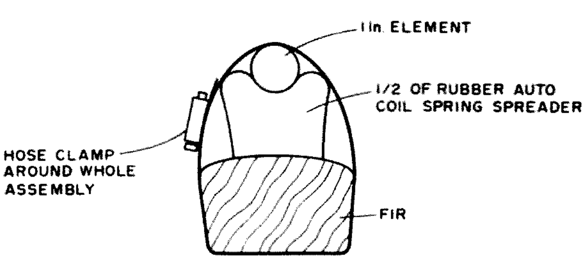
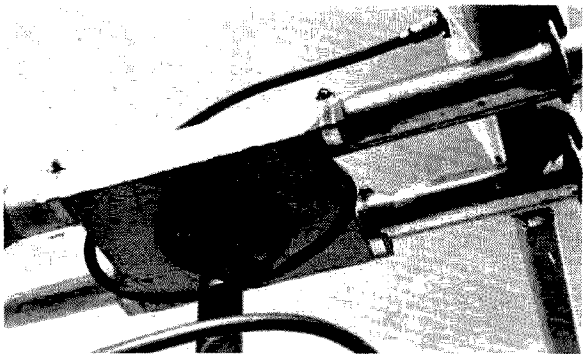


Fig. 2. End view of element mounting to 4' fir pieces.

After numerous disasters with quads and full size beams I developed a windproof minibeam which has been unharmed now for a year and a half. Based somewhat on an ARRL minibeam (*The ARRL Antenna Book*, ARRL, Newington CT, 1964, pp. 275-276), the present windproof version takes advantage of several additional features not utilized in the model which inspired it.

Physical Construction

A "double barrel shotgun" style boom was made from two 45.72m (12½ foot) lengths of 5.08cm (2") aluminum irrigation tubing, see Fig. 1. Three pieces of 5.24cm (2½") x 5.24cm (2½") aluminum right angle stock, 30.48cm (12" long), were attached to the two booms with U-bolts, with the outside of the booms spaced 17.78cm (7") apart. Each of the three elements, which has a coil in the centre, is mounted on 5.08cm (2") fir stairway hand rail measuring 10.16cm (4') in length. The aluminum elements are made from 2.54cm (1") and 2.22cm (7/8") O.D. aluminum tubing, left over after my Gotham beam fell down from the tower one windy night.



Special mounting channel fastened to the double boom with hose clamps.

The elements, although of different lengths when tuned, are each made exactly the same initially, except for the coils. Two 1.83m (6') lengths of 2.54cm (1") O.D. tubing are mounted on the fir hand rail with a 12.7cm (5") space between their inner ends. The outer ends of the 2.54cm (1") tubing are split about 3.18cm (1¼") and the 2.22cm (7/8") O.D. tubing can later be inserted and held at the desired length with hose clamps.

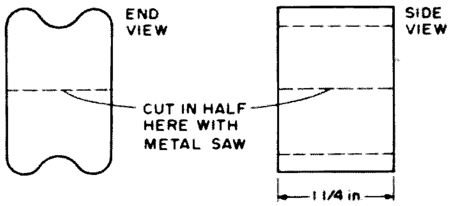
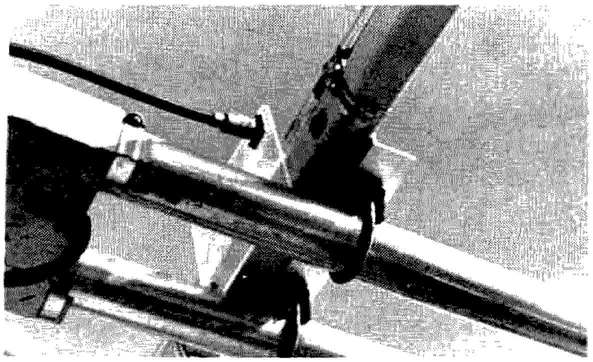


Fig. 3. Hard rubber coil spring spreaders.

The two 2.54cm (1") tubing lengths, 1.83m (6') each, are mounted to the fir with rubber stand-offs, made from hard black rubber auto coil spring spreaders cut in half so as to leave one side flat and the other with a round groove into which the elements fit, see Fig. 2. The original rubber spreaders cost 40¢ each at the local hardware store, and 6 are needed, see Fig. 3. The fir sections are mounted to the right-angle aluminum pieces in two ways. The driven element section is mounted differently than the other two elements. The right-angle piece is bolted to the two booms with 5.08cm x .95cm (2" x 3/8") U-bolts; then the fir section is bolted to the opposite surface of the angle with two chromed .95cm (3/8") bolts.



Driven element as viewed from below.

The aluminum angle stock is U-bolted to the ends of the two booms so that the opposite angle surface forms covers over the ends of the boom tubings. The fir sections are bolted onto the same surfaces as the U-bolts (for the two end elements only).

The mast used was a 5.08cm (2") diameter 1.83m (6') length of water pipe threaded and screwed into a flange plate. The threaded joint was then welded. Then the round flange plate was bolted to a piece of (homebrew) channel made by welding

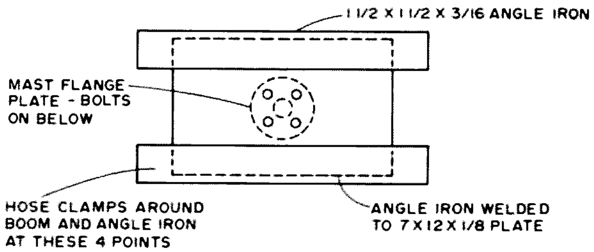


Fig. 4. Mast to boom mount. Beam is removed from the mast by removing the four 1-1/2 x 5/16 bolts used to secure flange plate to home-brewed fixture illustrated here.

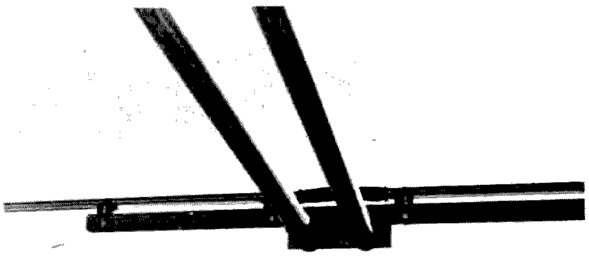
two 35.56cm (14") lengths of 3.81cm x 3.81cm x .48cm (1½" x 1½" x 3/16") angle iron to a 17.78cm x 30.48cm (7" x 12") piece of .32cm (1/8") sheet iron.

The angle iron protrudes 2.54cm (1") beyond the ends of the sheet iron and can be hose-clamped to the double boom with four large hose clamps, see Fig. 4.

The beam is easily removed from mast and tower by removing the four 3.81cm x .79cm (1½" x 5/16") bolts on the flange plate. The complete beam is easily raised and lowered from the 12.19m (40') tower by means of a rope, with one man at the top of the tower and one below. The beam weighs only about 20 pounds complete, less mast and flange plate. It is rotated with a husky homebrew 1/4 RPM homebrew rotor, enabling utilization in high winds. Probably the HAM-M or ROTO BRAKE models would be ideal for use in high winds also. In low wind areas a heavy TV type rotor would be adequate.

Electronics

Loading coils are used at the mid-points in each of the three sets of elements. The idea in this beam is to use an inductance to effectively "shorten" the total element lengths. Although each element could be extended out and clamped with only 15.24cm or 20.32cm (6 or 8 inches) of overlap to give element lengths of 7m (23 feet) or so, only the reflector comes near that length. Element lengths used on my version are given below. Actually, the element lengths utilized are not critical, so long as the appropriate element length/coil resonance combination is utilized. Ordinary 2.54cm (1") diameter B&W coil stock was



Director element, showing rubber mounting of each half element, with clamps and bicycle inner tube over the loading coil.

used with a 30.48cm (12") length of bicycle inner tube later cut and placed over the coils (on Director and Reflector only) and tied tightly around 2.54cm (1") aluminum ends, for weather protection of the coils. The D.E. coil is made of much larger and heavier 5.08cm (2") B&W coil stock, which when soldered is self supporting and left open to weather.

The Reflector and Director loading coils were both made from 2.54cm (1") B&W coil stock, close spaced #20 wire, so as to resonate the Reflector 500 kHz below center frequency desired and the Director 500 kHz above center frequency desired.

The reflector coil consists of 13 turns of 2.54cm (1") diameter B&W coil stock 2.22cm (7/8" long) with each half of the element 3.25m (10'8"). A space of 12.7cm (5") is left between the two halves of the element, for a total reflector element plus coil "wingspread" of 6.63m (21'9").

The director coil consists of 16 turns of 2.54cm (1") diameter B&W coil stock 2.54cm (1" long), with each half of the element measuring 2.27m (7'5½"). A space of 12.7cm (5") is left between the two halves of the element, for a total director element plus coil "wingspread" of 4.67m (15'4").

The driven-element coil consists of 8½ turns #14 on 5.08cm (2") diameter 1.9cm (3/4" long) of B&W stock with each half of the element measuring 2.86m (112 ½"). A space of 12.7cm (5") is left between the two halves of the element, for a total driven-element plus coil "wingspread" of 5.84m (19'2").

Feeding and Tuning:

The driven element is fed through an "inductive gamma match" with the coax shield going to exact coil centre and the inner coax conductor tapped 1½ turns from center.

The RG 8/U feedline to the transceiver should be a multiple of a ½ wavelength of coax. For example, at 14.1 MHz it would be 14.02m (46'), one wavelength, 21.03m (69'), 1½ wavelengths, or 28.04m (92'), 2 wavelengths, long. The coax is experimentally connected to various tap configurations, once the basic D.E. coil is installed, to obtain best SWR.

Each of the elements is again grid dipped by loosely coupling the dipper to each center coil, once the beam is assembled. The beam should be as high above ground for this adjustment as possible. I did these adjustments on my house rooftop, with the beam sitting on top of the 91.44cm (3') chimney (on a rare windless day).

Basic Materials Needed:

2 lengths of 5.08cm (2") O.D. aluminum irrigation tubing 3.81m (12'6") long
6 lengths 2.54cm (1") O.D. aluminum tubing 1.83m (6') long
6 lengths 2.22cm (7/8") O.D. aluminum tubing 1.83m (6') long
6 hose clamps for 2.54cm (1") diameter (element adjusting)
4 hose clamps for 6.35cm (2½") diameter (mast to beam holding)
12 hose clamps for 7.62cm (3") diameter 2.54cm (1") element pieces to fir hand rail
6 corks suitable to plug ends of 2.22cm (7/8") aluminum tubing (apply varnish afterward to seal)
Flange plate plus pipe for insertion onto rotor
3 pieces 6.35cm x 6.35cm x .48cm (2½" x 2½" x 3/16") aluminum right-angle stock, each 30.48cm (12") long
2 lengths of 3.81cm x 3.81cm x .48cm (1½" x 1½" x 3/16") angle iron 35.56cm (14" long each)
1 piece 17.78cm x 30.48cm x .32cm (7" x 12" x 1/8") iron plate
coil stock as described in text.

. . . VE7DKR

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TONES and How To Touch Them

As repeaters become more and more sophisticated, the main method of control seems to have standardized around the Touchtone pad. These devices are available from commercial outlets and the friendly 'Phone man. Cost varies and depends upon the source: they can be free or up to $25 for the sixteen button computer console model.

Following are several circuits for using the pads:

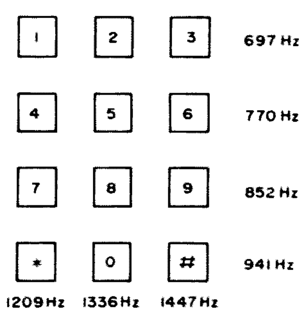

Fig. 1. Button locations and the corresponding audio frequencies produced.

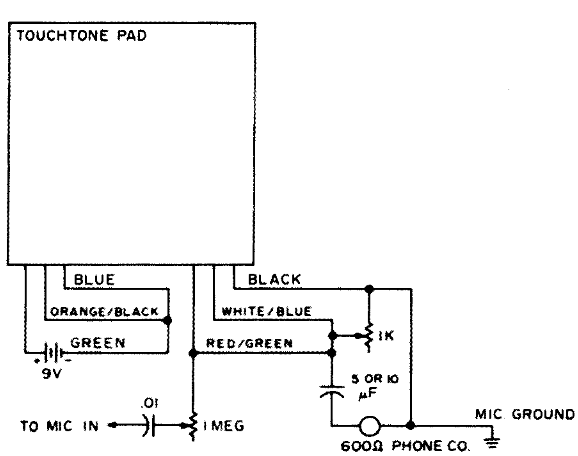

Fig. 2. Mike's WA4HQW circuit. Adjust 1k pot for clean non-distorted tones. Then adjust 1 meg pot for correct amount of audio to transceiver. HINT: Mike's pad worked with a 330 ohm fixed resistor for the 1k pot.

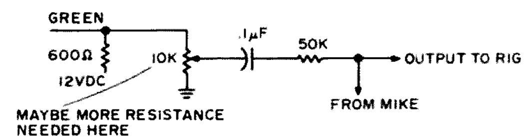

Fig. 3. Blue and orange-black = ground; black and red-green = together; green = output.

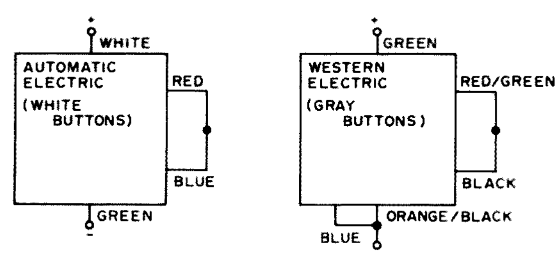

Fig. 4. There are two different wiring configurations for the pads. Pads made by Automatic Electric have one color code and pads by Western Electric, ITT, Northern Electric and Stromberg Carlson have a second code. (The Repeater Journal, Using the TouchTone Pad by WA4WTX.)

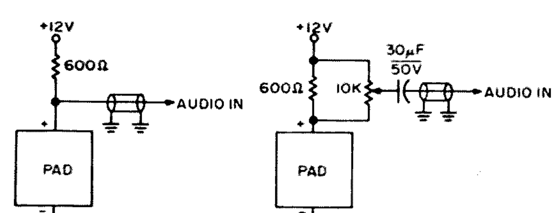

Fig. 5. There are two ways to connect the pads to the transmitter audio input.

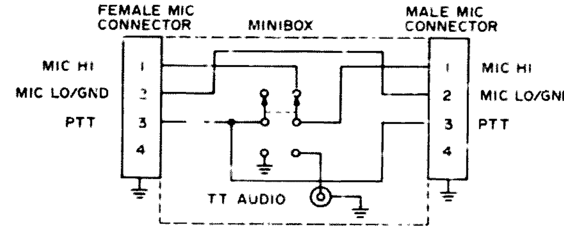

Fig. 6. In most cases the pad introduces noise into the transmitter if left connected. This noise is usually in the form of vibrator hash or transistor.

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whine. A DPDT switch can be used to switch the pad into the audio circuit and key the transmitter. With the appropriate connectors and a minibox, the pad connects into the mike circuit with no modifications to the radio.

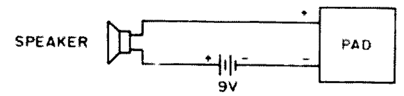

Fig. 7. For use with a walkie talkie, a small speaker can be used for the load resistor and a 9V battery can be used. Since no current is drawn until a button is pressed, a switch is not needed. Battery life is good as the pad draws less than 15mA. Voltages from 4 to 48 can be used on the pad and the frequency will not change. However, 12V is recommended.

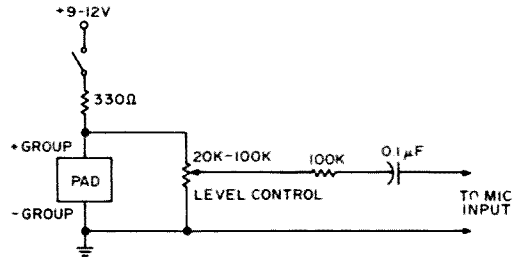

Fig. 8. Information on phone pad hookup for cabon mike input rigs has been published in the April issue of 73. The following circuit works very nicely for high impedance mike input rigs such as most of the all transistorized Japanese ones. (By Alan Tasker WA1NYZ from the WA1KHB Newsletter.

. . . K1NUN

TOOL AND TIME SAVER

How many times have you needed a special tool for a piece of equipment only to discover that it had long since vanished into the limbo normally found in the average hamshack? A small magnet with a fuse clip or TO-5 heatsink attached, mounted in as out of the way location inside the rig will hold an alignment tool plus several Allen or Bristol wrenches. The magnet may be from an old speaker or if you really want to go first class you can buy one for 10 or 20 cents from the local 5 and 10 store, or the local outlet of an electronic chain store which will remain nameless. Epoxy the clip in place, install the tools the next time you run across them and never again spend half a day looking for the @†$%&! things.

. . . Bill Turner WAØABI

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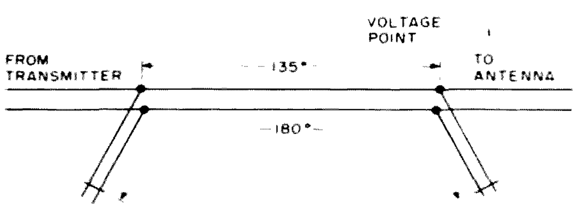
The Double-Stub Matching System

Looking through the standard reference materials on antennas, the amateur notices a number of interesting antenna configurations that would be fun to try, assuming enough space is available. Commercially built beams and homebrew dipoles are fairly easy antennas to use since the impedance match presents no problem. Most of these can be directly connected to the transmitter output (using coax, of course, unless you can get the rig up there), and you're on the air. The more complex arrays, giving considerable gain and directivity, often do not have a direct 50Ω match, requiring some sort of impedance matching device to make everything perk along at peak efficiency.

There is considerable literature on common matching devices. The coax balun, for instance, gives a 4:1 step up. Toroids can be wired for all sorts of combinations using the transformer-turn-ratio theory. ¼λ transmission line segments act like impedance transformers. Pi, L and T networks can be constructed from coils and capacitors. These projects can be done easily.



The transmission line stub method is also used with great success for matching impedances. Great quantities of information are available on how and where the stub method works. There is another method, the double-stub method, that isn't used too often but is surprisingly efficient and simple. At lower frequencies the single matching stub gets quite long; it isn't such a good idea to have these drag on the ground, especially if you're using open-wire line. The double-stub method reduces the length required. These are actually more convenient to adjust once the initial setup is made. A single stub has to be slid back and forth on the transmission line while the shorting bar has to be slid up and down until the proper match is found. The double stub sets by formula and measurement, and then the final adjustments are fairly easy.

In effect, the double-stub system is a transformer, a ½λ long, extending from closed stub to closed stub. One line begins at one stub, the other ends at the other, with the line in between a "common" winding. The "match" picks the proper impedance off the line at the appropriate point. Obviously, since there is a ½λ between the stubs, they cannot be adjusted independently – the adjustment of one affects the other and both have to be moved simultaneously the same distance and direction to

maintain the ½λ separation.

Assume you have built an exotic system, such as a Lazy H or 8JK as described in popular literature. These, along with others, have a tremendously high impedance at the feed point and you want to match to 300Ω open line, converting to 75Ω coax thru a balun. We're using open wire line since it is so much easier for the following steps than using coax would be. We can, of course, apply the same principles to coax and get the same results, but you'll see why open wire will be the choice.

It is fairly easy to get open wire line. A 152.4m (500') roll is not particularly expensive, but be sure to use transmitting type. 300Ω is the most convenient and easiest to get; 600Ω is still made but is fairly expensive. Of course, you can make some spacers or get some of the commercial spacers and make your own line of whatever impedance you may want. Sufficient data exists in standard reference books to come up with about anything you would want.

First, feed the antenna with the open-wire line and go back a convenient distance. You may want to use a precise length, coming to an exact ½λ point, for minimum SWR (tuned line), but if you do the next steps properly, you should get the SWR to 1.1:1 or better.

Next, find a voltage point on the line. Since the line and the antenna are not matched, you will have considerable SWR. Couple a neon bulb to a few turns of wire and move it back and forth on the line while applying a little power (watch those finals!) and when the bulb glows, you're at a voltage point. To make sure, you can go back toward the transmitter and the voltage peak should repeat every electrical ½λ. Remember in verifying to consider the velocity factor of the line. A voltage maximum corresponds to a current minimum, and reactance will be zero at this point. This is where we attach the first stub.

Remember, the distance between the shorting stubs is to be a ½λ. We could attach the second stub almost anywhere down the line toward the transmitter short of 180° (if the stubs were at exact ½λ points, we would lose our transformer action). However, the experts find that for maximum efficiency, we want to go back precisely 135°. Calculate this at the design frequency remembering to multiply in the velocity factor. There are several fairly complicated formulas involving square roots and cosines, but we are not trying to get involved in higher math in this article. Take our word that 135° is the right place! Attach your second stub at this 135° point, and then short the line on the stubs 180° apart. You have a tolerance of ±0.5 λ. Slide both stubs together the same direction in relation to the transmitter to maintain the 180° spacing until you have the proper match. That's it! The stub toward the antenna tunes out the reactance while the stub toward the transmitter is for the proper impedance match.

There are some more formulas that give the active lengths of thy stubs. There are variables, of course; for a start try between 20° and 25° down from the transmission line on the stub for the shorting bar (remember it's important to maintain the 180° between the stubs) and start tweaking from there.

...WA6CPP

HEAT SINKS FROM SCRAP

Nearly everyone who works in an office or industrial plant has seen the semipermanent walls and partitions which have become so popular due to the ease with which they may be installed, added to and moved. One of the most popular types consists of panels of laminated plaster-board and various types of aluminum extrusions. These extrusions are provided to attach the panels to the floor, to each other, to seal the top and bottom, make corners, etc., etc.

Several of these extrusions are excellent for making no cost heat sinks for power transistors, diodes, SCR's, and triacs. The spacing of the fins allows the installation of even the largest semiconductors. The next time you see such an installation being made, scrounge some scraps of each type. Any length over about one inch is usable. After a few minutes picking over the scrap pile you will never again be called upon to plunk down cold cash for a heat sink.

...William Turner WAØABI

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How You Can Teach Novices

It's easy with the new teaching aids.

Amateur radio is one of the few technical hobbies that is regulated by the government. Because every radio amateur must show a minimum ability in morse code and theory, it is also one of the few hobbies where the beginner will face an almost impossible task unless help is offered by experienced amateurs.

Having taught code and theory courses for several years, I have found them to be helpful and a rewarding experience for both the beginner and teacher. Many hams have the time and knowledge, but lack the final push to start the course. Hopefully the suggestions in this article will provide that push.

The first step is to find a sponsor. This can be the local radio club, a Red Cross Chapter, or RACES. But the sponsor should be the type that would not be willing to take the credit and give the work to the teacher. Generally mentioning that the students will become a source of members for the sponsoring organization will produce results.

The second step is for the teacher to decide how many days he can devote to teaching the course. I found that teaching two days each week is the best way to go. I try as close as possible to cover the same material each night. This allows students to switch from one night to the other night should they be unable to drop by on their regular night. Some weeks the course has an imbalance, but generally each night will average out to an equal number of students. I could tell that the students were getting more out of each session as the weeks progressed, because they were not falling behind due to missing as much as they would have done if I taught on only one night.

Once the nights have been established, then it is important to select the classroom. I have taught in county relief offices, civil defense rooms, rural electric co-operatives and board meeting rooms. The ideal classroom should have a large blackboard, a movie screen, electrical outlets, desks or tables and chairs and good lighting. It should be in a low crime area, there should be parking nearby and someone should be there to let the class in and to lock up. I generally reserve the room from 7:00 to 10:00 in the evening. I try to start out *promptly* at 7:30 with 30 minutes of code practice, and if I am teaching novices, to end with another 30

minutes of code practice. The *official* departure time is 9:30, however, there is almost always an interesting discussion going on that seems to last until 10:00. Reserving the room for 30 minutes before the class starts allows time for ragchewing and sometimes I have held a help session for those who are having a difficult time with the morse code.

I mentioned the time, because some locations that would make ideal classrooms close at 9:00 and this can complicate their schedule and yours.

Some public and private schools will open their doors to non-profit groups. Some libraries have free meeting rooms. Some YMCA, YMHA or YWCA organizations will welcome your class as an addition to their programs. Also some churches have a policy of allowing community groups to use their facilities. The important thing to stress is that the students are generally adults and that you will use their rooms without damage. Check also on a smoking policy. If smoking is allowed, then be sure that ashtrays are available and that they are used. It will win your group with the janitor if you "police" the area after the class is over to avoid leaving soda bottles or cigarette butts on the floor.

Once the room has been reserved, the time picked and the teacher is ready, the next step is the selection of textbooks. I started out teaching with the ARRL publication group "Gateway to Amateur Radio." When the FCC upgraded their test requirements it became difficult to memorize the questions and answers. I then switched to the Ameco "Radio Amateur Theory Course" with improved results. The student could use the same book for both Novice and General license tests. However, the FCC has once again upgraded their tests when they introduced incentive licensing. At present the prospective amateur cannot hope to memorize any textbook and hope to pass. Now the prospective amateur must know and understand the basics of radio theory. Searching for an improved text, I came upon the publications by 73 Magazine. 73 recommends the use of their 5 and 6 wpm code tapes as well as their Novice Theory Cassette Course and their Novice Theory book.

They develop the theory with a minimum of mathematics. And they deal with the study questions furnished by the FCC by amplifying them into easy to deal with questions and then they show how to solve the problems. The illustrations are easy to read and understand. If I had to find fault, then I would point out that a student wishing to go from novice to general needs to purchase two books. However, both texts are excellent study guides and would be welcome in any amateur's reference library.

I have found that while it can be done, it is difficult to run a code and theory course for both Novices and Generals in the same room at the same time. The Novices are left behind by the General theory and code, while the General class students become bored with relearning the basics of theory and code. The General class code and theory course has to be played by ear. The teacher will have to tailor the class to the needs of the class. I have yet to find two classes that act or react in the same manner. I would recommend that the "General Class Study Guide" by 73 Magazine be strongly considered as the text for the class. If the teacher feels ambitious, he may want to also consider the addition of the "Advanced Class Study Guide." (As well as 73's 13 and 20 wpm code cassette.)

The best combination of texts for the Novice class course, I have found to be the "Novice Class Study Guide," and "CW" both published by 73 Magazine. To keep the class current on the FCC rules and regulations, I would suggest 73's reprint of the amateur section of the rules and regulations. The class sometimes tends to become sidetracked with questions on antennas and on operating procedures. Including a copy of ARRL's "Understanding Amateur Radio" will take care of most of the questions that the class might come up with during your theory sessions.

One final word before we begin our search for students to fill the class. The teacher has enough problems without being forced to donate a code practice oscillator as well as his time. If he has one and is willing to bring it to class then I say fine. But I have been in the position of having to purchase an

oscillator with cash from my own pocket and that should be the responsibility of the sponsoring group.

The search for students begins with a press release. The press release should be given to the press, but in addition, copies should be given to the club bulletin editor, other local amateur clubs, CB organizations, Boy Scout Troops, Girl Scout Troops, Red Cross Chapters and anyone else that you might think of that would be interested in having an amateur radio license. Word of mouth is a powerful means of communication. Nuns comprised 20% of one of my classes one time. Now I automatically let them know before each course. Wives or husbands of hams are good student material, also. I try for families by requiring that there be at least one set of books per family. And I have had many husband/wife combinations.

The First Night

The first night should begin with a welcome speech and introduction by the teacher. Before they start with their questions, pass out their books to them, collect the money and announce that you will be glad to answer any and all questions after the code session is over. Begin with the letters E,I,S,H,A,W,J. (The reason for this order will be explained later.) These are among the easiest letters in the code. Take it easy and at the end of the code session compliment them on how well they are doing. Your praise and their newly learned code ability will encourage them. Many of their questions will be in two catagories: how much does it cost and how far can they get with just dots and dashes?

You should answer their questions to the best of your ability, and the ones that you would rather not answer (antennas, SSB, etc.) at that time you can delay by telling them that you will be glad to answer their questions, but you feel that they would better understand your answer in a few weeks.

After a 15 minute question session teach them Ohm's Law and the Power formula. Stress and explain that the reason that they must learn to use these equations is that they are not only required knowledge by the FCC, but they are used almost every time a Novice operates. Keep the units basic. Leave the introduction of Mega-, kilo-, milla- and micro- for the next lesson.

When they leave, they should understand how to use the equations and what the units mean. Assign them the first two chapters in their Novice class study guides to be read for next week. Finish the first class session with a short and simple code test to see if they have learned their letters. Most students will know them and that leaves them with a good feeling and will tend to encourage them to return the next week.

The Second Night

Congratulate them on showing up and begin the code session with a review. This has two purposes. Those who missed the first session will have a chance to catch up. And it begins the session out on a positive note for those who were there the week before. After a brief review, introduce the letters F,V,L,P,R,U. Stress them as well as the letters learned the week before.

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Review Ohm's law and the Power formula with them. Then introduce the concept of Mega-, Kilo-, milli- and micro-. Work some problems out with them using the new concepts. At this point, I try to have an active amateur with a General class or higher license in to speak to them and answer their questions. The questions should be allowed to continue until it is time for the code session. They should be assigned chapter 3 for next week. Finish with a good code session.

The Third Night

Review the previously learned letters and then introduce T,M,O,N,D,B,G. The theory session should begin with the concept of frequency and wavelength. Let them know where their bands will be. For a guest speaker, invite the local DXer to come and tell them the DX possibilities that they will have on their bands using 75W CW. Have him bring some of his cards and awards. This will give them a taste for wanting to really get their license and operate. Again finish with a review of the 20 letters that they have learned.

The Fourth Night

Some of your students will be falling behind in their code. Surprise the class and do not introduce the remainder of the letters. Instead, make this class session a review period. Review the letters that you have already taught them and review the theory they have learned. Introduce the formula for the resonant frequency of dipoles. Do not have a guest lecturer for the fourth session. Make certain that you are not leaving anyone behind in a state of confusion. Finish with another code review. Skip chapter four and assign chapter five.

The Fifth Night

Finish giving them the rest of the letters. I feel that the best practice is simple and straight text. Save the code groups for later. The important thing now is to stress accuracy and let their speed build. The guest lecturer should be an experienced Novice or former Novice. By now they will know enough to ask specific questions. The final code session should be straight text again.

The Remaining Sessions

Let the advanced students send to the class to build their sending ability and give the rest of the class experience in hearing fists other than the teachers. The theory sessions should revolve around the FCC regulations, and the guest lecturers should come from the local available talent.

Sometime toward the end of the alotted time, have each student fill out a 610 form. (But don't date them!!)

Give a mock written exam. Try to make it as close to the FCC multiple choice test as is possible. Go over the test with the class and make sure they understand any mistakes that they may have made. Stress always your satisfaction on how they are progressing.

The Final Session

Give them their code test. Those who pass should date their 610 forms. You as the examiner should send in their forms to the FCC. Then you can both fret until the test returns and they have passed.

Hints

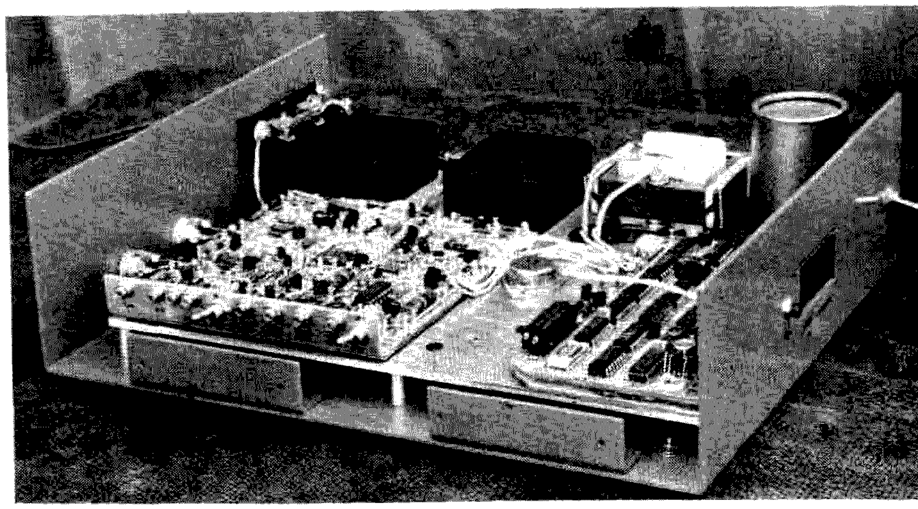
The information given here is from my own experience. I have not seen two classes act or react in the same way. I have chosen the order of teaching the code given in the text, because it has cut the time to learn the code by 50% over any other system. (If you have never used this system before, it is based on learning those letters that begin with dot and then those that begin with dash. Try it. It works.)

I do not teach the numbers. They are not required by the FCC for novices and I feel that the process is confusing enough without adding any more confusion. However, numbers and punctuation is not difficult to learn and they can easily pick it up in one session after they have passed their Novice code test.

Teaching a code and theory course will bring you the first of your grey hairs. But it will also bring you many little novice friends and a warm glow inside from having shared our hobby with others. I tried it once and got hooked. I hope that you will too.

. . . WB2PTD

A Digital SWR Computer!



Terry Mayhugh W6OTG
537 West Church Street
Ridgecrest CA 93555

Part 1

Although the average ham has to know very little about just how computers actually work he certainly can (and does) take advantage of their capability. Not only might a computer have helped to design some of the equipment in his shack, but he may be using a few special purpose digital computers himself to display the receiver frequency or to send pre-programmed CW messages.

This article describes a special purpose hybrid computer which automatically computes the SWR in a 50Ω coax feedline and numerically displays the answer. An operator using this device does not have to bother flipping switches to get forward and reverse readings while frantically trying to simultaneously tune his transmitter and/or transmatch, as he would on a typical SWR meter. This computer is called a hybrid because it is two computers in one — an analog computer and, if you will, a digital computer. The analog section does the actual SWR computation, and it is described in this article. If a meter type readout is desired this is all that need be built to have a computing SWR meter. Next month, the digital section consisting of an A/D converter and a display will be described.

The objective of the circuit design was to obtain the best accuracy available practically. Thus, some rather exotic op amps and metal film resistors were used in the final design. Some critical resistor values were precision matched during the alignment as described later, and this may be desirable to others constructing the complete instrument with the digital readout. Of course, if a panel meter readout is desired such accuracy isn't required and one could get away with using cheaper 741 type op amps. When you stop and think about it, who wants or needs to know his SWR so accurately? Actually, I don't think anyone does, but the circuitry is interesting and that will be reason enough for many to build the instrument.

Circuit Description

Analog Section

Fig. 1, is a schematic of the analog section. The computer receives two voltage outputs from the RF pickup, V_F and V_R, and then mathematically computes the SWR using the formula:

$$SWR = \frac{V_F + V_R}{V_F - V_R}$$

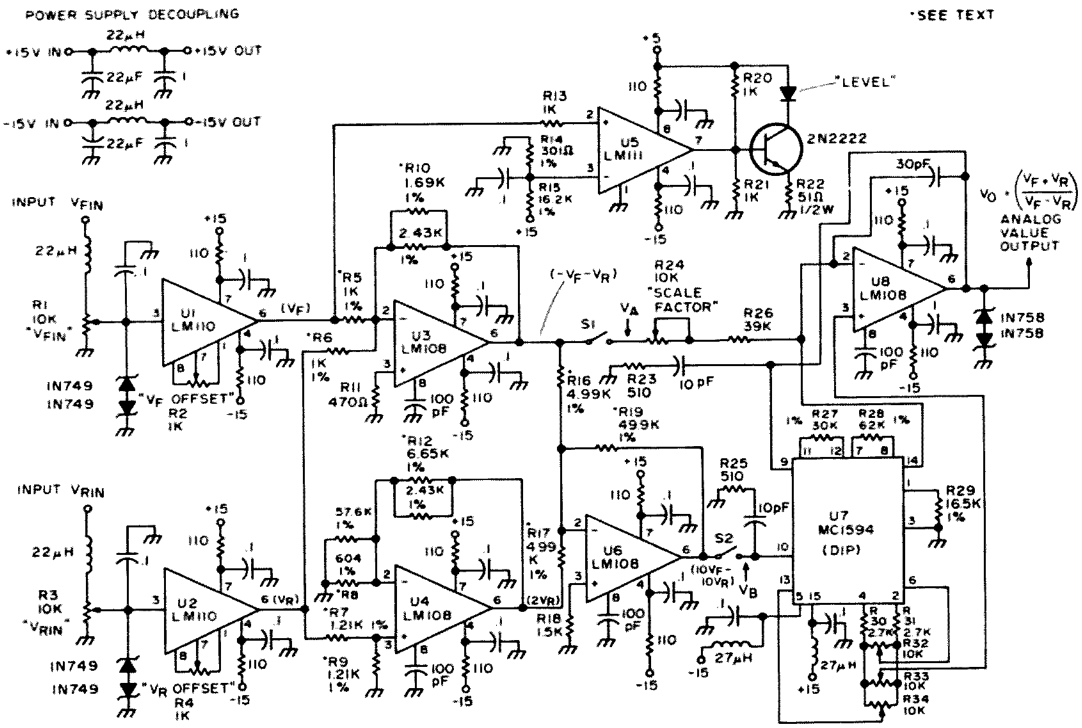


Fig. 1. Schematic diagram of the analog computer portion of the SWR meter.

The heart of this section is a monolithic analog multiplier chip, the MC1594, used in an analog divider configuration. If the op amps and alignment techniques suggested are used, the accuracy of this portion of the computer will be limited by the accuracy of the divider chip which is less than 1% over a much wider temperature range than the computer will ever see.

U1 and U2 serve as input buffers for V_F and V_R, respectively. U3 is a unity gain summer-inverter and produces at its output the sum ($-V_F - V_R$). Resistors R5, R6 and R10 should be chosen from 1% metal film types to obtain the following ratios as accurately as possible:

$$\frac{R10}{R5} = 1 \qquad \frac{R10}{R6} = 1$$

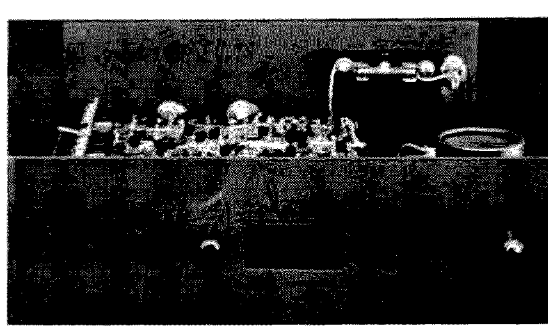
The values chosen for these resistors should lie between 1K and 10K for best results. Because I had several different metal films but not too many of any one value, I chose R5 = R6 = 1K and initially chose R10 a little larger than necessary and then trimmed it later by paralleling another value across it as described in the alignment section.

U4 is a simple precision X2 amp and values for R7, R8, R9 and R12 should be chosen as follows:

$$\frac{R7}{R9} = 1 \qquad \frac{R12}{R8} = 3$$

Again, I chose values for R7 and R9 but then trimmed R12 and R8 during alignment. U6 is a gain-of-10 summer-inverter and its feedback resistors are chosen as follows:

$$\frac{R19}{R16} = 10 \qquad \frac{R19}{R17} = 10$$



A rectangular window is cut in the front panel for the display. A piece of transparent red plexiglass is epoxied in from behind for proper filtering for the LED display. The level indicator lamp is to the left of the window. The completed instrument was housed in a 9" x 3" x 11" homebuilt housing (with cover). BNC connectors for inputs from the rf pickup are on the rear wall. Alignment pots are on the L-bracket at the left.

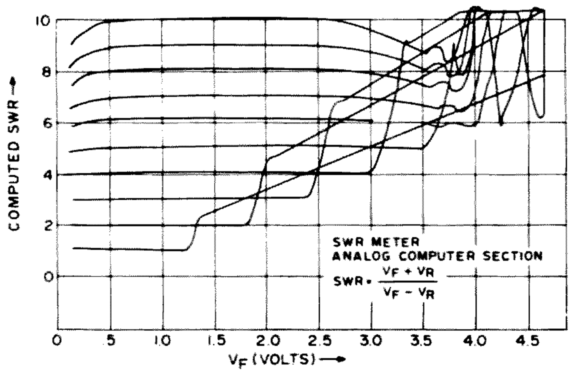


Fig. 2. X-Y recorder plot showing dynamic range of analog section exclusive of RF pickup as a function of V_F.

The output of U6 is ($10\ V_F - 10\ V_R$), and this is fed to the divider as the denominator. The output of U3 is ($-V_F - V_R$) and is used as the numerator. U7 is placed in the negative feedback path of U8 to form an analog voltage divider with a scale factor of -10. Therefore the output is $(V_F + V_R)/(V_F - V_R)$.

For best linearity in the divider, R28 should be twice the value of R27. Decoupling networks are used on each IC as well as on the input ports of U1, U2 and U7 to keep the rf out of the computer circuitry. U5 is a comparator which monitors the input level and lights a panel lamp to tell the operator that he is operating within the dynamic range capability of the device. This is necessary since all analog division schemes have good accuracy only over limited dynamic ranges. Fig. 2., illustrates the dynamic range of the analog section.

Regulated ±15VDC supplies at 40mA are needed to complete the construction. Modular supplies were used in the prototype, but there are many designs available to the experimenter. A 5V supply is also used in the comparator, and it will also be needed in the digital portion to be described next month.

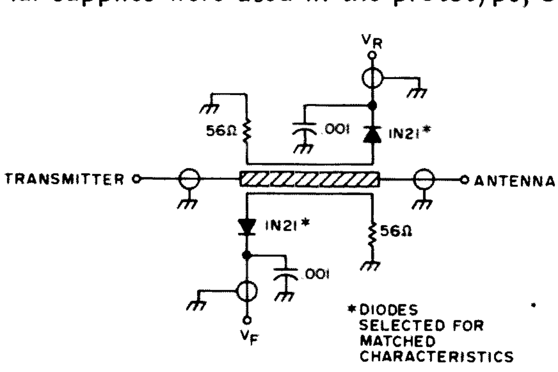


Fig. 3. Schematic of rf pickup. Diodes should be matched for best accuracy.

The schematic for the rf pickup is shown in Fig. 3. It is built on an etched fiberglass circuit board and the pattern used is shown in Fig. 4. The entire assembly is enclosed in a Bud minibox fitted with SO-239 connectors for the feedline connections and BNC connectors for the dc outputs. A pair of matched IN21 diodes was selected using a curve tracer from a bag I purchased from a surplus distributor but the builder may use what he has available and match them as closely as he desires. Unfortunately, the overall instrument accuracy will be determined by this match. Others might be interested in coming up with a temperature compensating scheme to keep the match valid over a wide temperature range. Temperature compensation techniques have never interested me and the rf pickup circuitry that I used shows it.

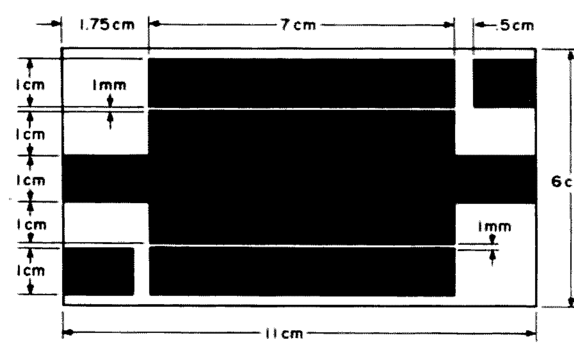
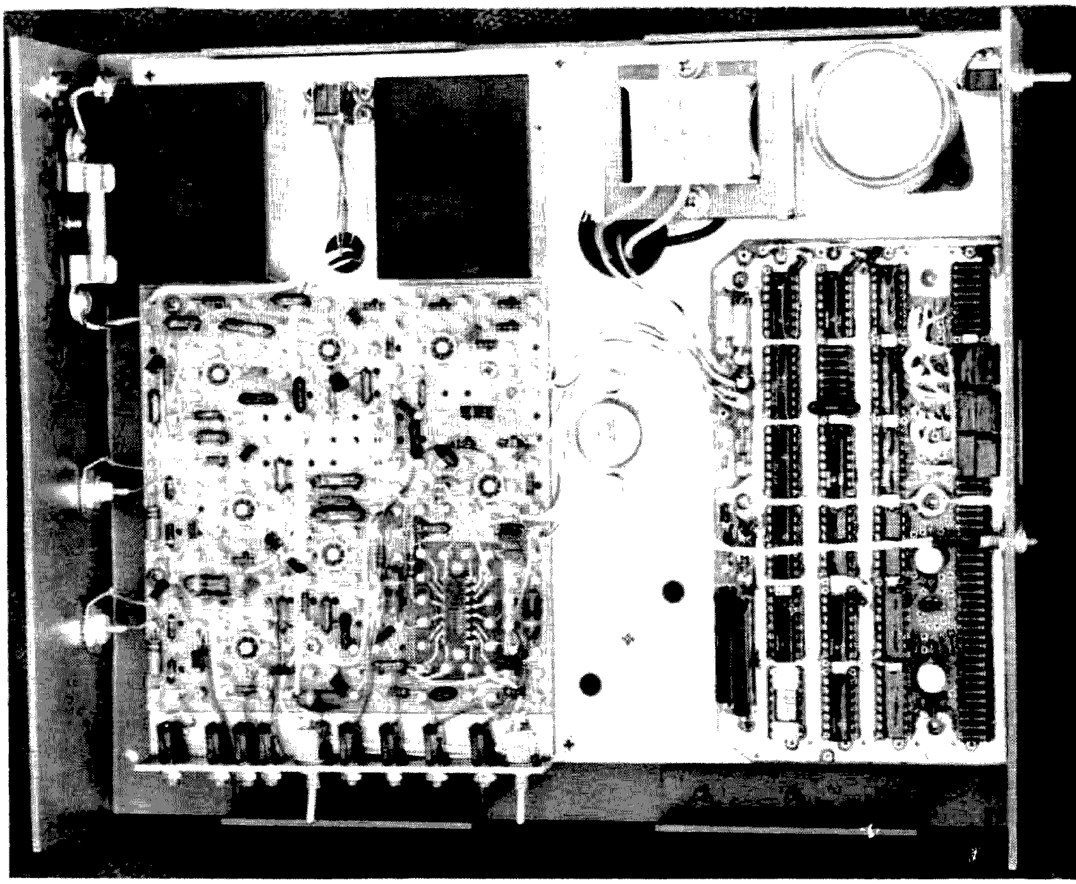


Fig. 4. Foil pattern for rf pickup. Black shaded areas are the foil lanes.

Alignment

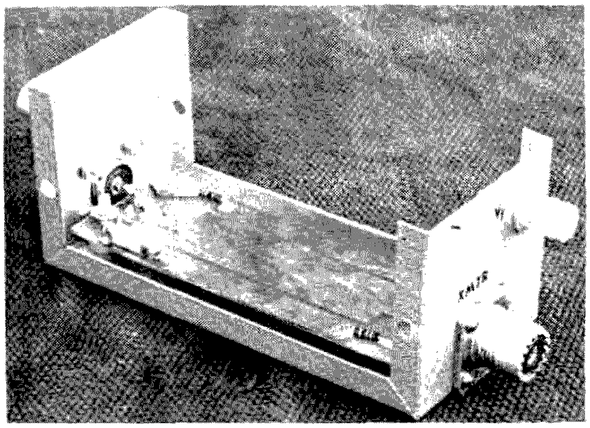
Several alternatives are available for alignment depending on the accuracy and the type of readout desired. The following steps provide the most accurate alignment, but a DVM is required. The accuracy of the instrument can be no better than that of the DVM used. If a panel meter readout is desired a VTVM may be used for alignment and precise selection of the op amp feedback resistors is not necessary, although 1% values should be used to obtain the required ratios. The alignment procedure is as follows:



The digital board holds the display and is mounted at the front of the instrument. The analog components are mounted on the Vector board at the rear. The two black modules are the +/-15V supplies. The transformer is for the 5V supply.

1) Set controls R1 and R3 to their mid-range positions. Short the V_F and V_R inputs to ground and adjust R2 and R4 to give OVDC at the outputs of V1 and V2, respectively.
2) Apply approximately 3VDC to the V_R input and then adjust R3 for exactly .5VDC out of U2. Then measure the output of U4. Trim R8 and/or R12 until the output measures exactly 1VDC.
3) Measure the output of U3. Trim R10 until this voltage is exactly -.5VDC. Do not change the value of R10 in the following steps.
4) Apply approximately 3VDC to the V_F input and then adjust R1 for exactly .5VDC out of U1. Again measure the output of U3 and trim R5 until the output measures exactly -1VDC.
5) Remove the V_F input and trim R17 and/or R19 to obtain exactly -10 VDC at the output of U6. Do not change R19 in the following step.
6) Replace the V_F input and trim R16 until the output of U6 measures OVDC.

Open switches S1 and S2. The divider circuit will be aligned separately with externally applied voltages.
7) Set V_A = O (ground it) and adjust R33 until the output voltage (V_O) remains at some (not necessarily zero) constant value as V_B is varied between +1V and +10V.
8) Maintain V_A = O volts, set V_X = +10V and adjust R32 until V_O = OV.
9) With V_A = V_B and adjust R34 until the output voltage remains at some (not necessarily -10V) constant value as V_A = V_B is varied between +1V and +10V.
10) Maintain V_A = V_B and adjust R24 until the average value of V_O is -10V as V_A = V_B is varied between +1V and +10V.
11) Repeat steps 7 through 10 as necessary



The rf pickup is housed in a 2-1/4" x 2-1/4" x 5" Bud Minibox. Cartridge diodes were soldered dir ectly to the pc board.

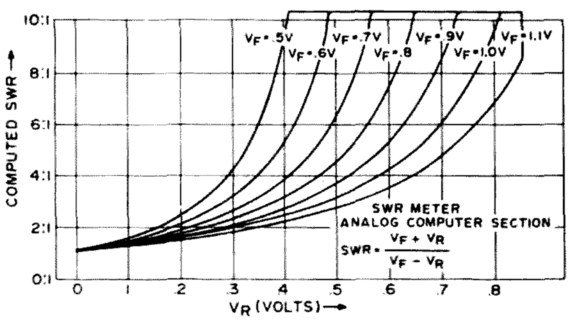


Fig. 5. X-Y recorder plot showing accuracy of analog section exclusive of rf pickup.

to achieve optimum performance.

Close switches S1 and S2 and the analog computer is ready for use. Fig. 5, shows recorder plots of the performance. If a digital readout isn't desired all that remains is to connect a O -10VDC meter at V_O and the rf pickup, and SWR's from 1:1 to 10:1 can be read directly. The outputs are clamped to keep the meter from going off scale at higher SWR's.

R1 and R3 will have to be adjusted one time for the particular transmitter power used. I set R1 so that with about 50 watts dc transmitter input, there was about .3VDC measured at the output of U1. With my SB-401 at full CW power and my particular rf pickup, the maximum value of V_{F1N} is about 3VDC. The level indicator will light with V_F greater than approximately .25VDC so that the input is within the dynamic range of the instrument (as seen from Fig. 2).

The optional second half of the computer will be described next month. Even if you don't want to use it as a display for this instrument, it will make a great DVM for other uses around the shack. . . . W6OTG

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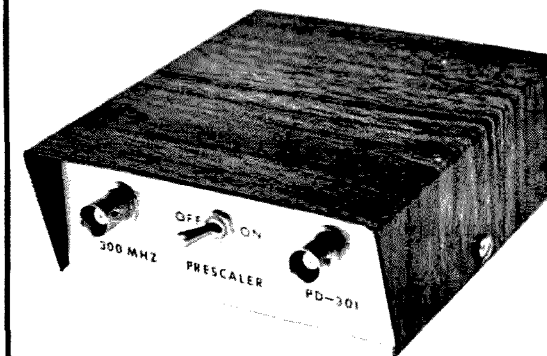

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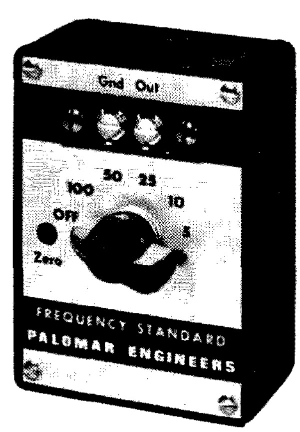

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Bill Hoisington K1CLL
c/o 73 Magazine
Peterborough NH 03458

A Real Hot Front End for Six...

This describes an excellent front-end circuit for a six meter receiver using microminiature transistors. It is intended to be a companion unit for a transmitter using the same devices, the GE D26G-1, which is a 2N918 chip in a tiny plastic case with a volume of less than 1/16th inch cube.

The design of a complete rig may be taken up later, as it is a complicated affair with many choices such as a pocket set, helmet set, camera-case job, etc. Batteries are involved in such packaging, but this is not too bad a problem with the power requirements of microtransistors. Also to be considered are case size and disposition of tuning and switching knobs, speaker or phones, mic, antenna and cost.

I'm intrigued by cigarette pack-size rigs, Dick Tracy jobs, etc., but my common sense will probably call for a small camera-case type. You've got it on a strap over your shoulder, the battery is inside, you can tune the "dial," the antenna can stick out over your left shoulder, etc. So, later on for all that, and we take up here the basic circuit using small components, describing the rf, mixer, and oscillator – always the main key to a receiver – and a tunable module 1¼ in. square by ½ in. thick.

As an example of what can be done today at a reasonable cost with microtransistors, Fig. 1 shows a schematic and Fig. 2 the layout of an oscillator module. This particular unit is a tunable local oscillator, at present padded from 51 to 55 MHz, for use with a 1.65 MHz i-f. Pushing the power up a little, it will put out 15 to 20 mW of rf as a test transmitter. This bandspread will probably be adjusted later to cover 51.5 to 53.5 as an L.O. for 50 to 52 MHz signals.

Looking at this unit you see at once the outsize components which are the tuning capacitor and, to a lesser extent, the inductance. I have a possibility of a micro-coil for around a dollar, of which more later. The Johnson type "U" 14 plate variable capacitor does for the moment. It came with a 3/32 in. shaft, which was adapted to a ¼ in. shaft. Anyone knowing of a smaller suitable unit please let me know. A ¼ in. brass shaft was drilled out for the 3/32 in. shaft and the end slotted with a jeweller's saw, and soldered. Depending on how many additional modules you use, and the exact final packaging shape, you can use a bigger or smaller knob and dial pointer.

At any rate, this oscillator module is right now only ½ in. high by 1¼ in. square, and can serve as a starting point for a tunable pocket-size 6 meter rig. You will

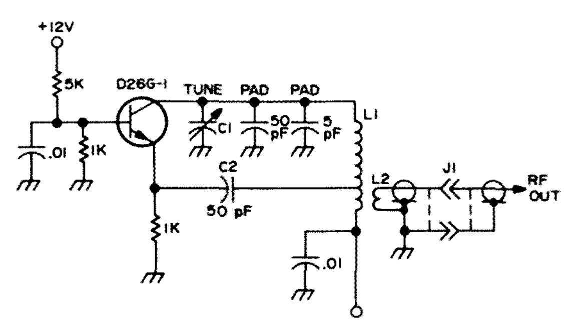


Fig. 1. Small oscillator module schematic. L1=9 turns No. 26 tapped at 1 turn from the low end and wound on a 1/8 in. impregnated form. L2=1 turn or 2 turns for more output. C1=14 plate Johnson type "U."

probably be safe in planning for each stage to be no larger than this little plank, as it has a functioning microtransistor, an inductance, a tuning capacitor, dc bias resistors, bypass capacitors, and padding capacitors. The device at present is the GE microtransistor D26G-1, with the usual Allen-Bradley 1/10th watt 5K and 1K resistors in the base circuit, bypassed with a .01 "Slimcap" by Mucon, made by the Republic Electronics Corp., Paterson, N.J. They are really small, being only 60 mils O.D., but they do work!

The emitter has a 500Ω 1/10th watter, which may go to 1000Ω later because this unit is drawing about 7 mA at present, which is more than needed. During tuneup it was found that this is related to the position of the emitter feedback tap, which should be carefully adjusted so that it will not be too far up on L1 of Fig. 1. If this tap is placed up several turns on L1, there will be too much feedback and the current will be higher than needed. The final circuit shows one turn only. Check this point if you're in doubt.

A 50 pF capacitor from the emitter to the tap on L1 establishes the proper positive feedback, which is in phase with the collector. This makes the base out of phase with the collector, a necessary condition for oscillation.

L1 has 7 turns of No. 26 ssc, closewound on a 1/8 in. form, with a tap at 1 turn. This produces a bandspread of about 4 MHz when using the parallel pad of C2, which is 55 pF in this unit. Naturally a different tuning capacitor for tuning may necessitate a change in L1 and C2 also. For more bandspread (less tuning range) go down on L1's inductance and up on C2's capacity. Do not use over 75 pF however, for a 6 meter L.O., as power will begin to drop, unless you use a bigger device and really need more padding.

Another component which is still "huge" is the rf output jack. The one shown is the smallest phono jack I know of, made by Teletronics,Yonkers, N.Y. Of course if you build the modules all together you can use the short open end of the small coax cable such as 50Ω RG-174/U to hold the open end of the pickup loop L2.

The device itself is mounted on three .021 pins, as described in the first part of this series, which also serve to hold most of the other components too as you can see in the layout, Fig. 2.

L1 started out with about 10 turns, and some padding, and ended up with C2 being a 50 pF and a 5 pF in parallel. These little 60 mil cylindrical capacitors are not given away I might add; they run to around $1 per capacitor, so please remember that I already have mentioned a rising cost with decreasing size.

I hope this completed and working module will give you some ideas of how to plan for a pocket rig. It's doing just that for me right now.

The Local Oscillator

A natural thing to do when building a local oscillator to tune from 50 to 52 MHz signals, is to put in what looks like a high Q coil, and then bring it to the desired frequency with a small tuning capacitor. In the case of 50 MHz L.O. this capacity may be very small in order to spread the 2, or 4 MHz desired over some 90 degrees of the dial. The results of the above procedure can be undesirable, as follows: (a) High harmonic content with consequent increased risk of harmonic detection. (b)

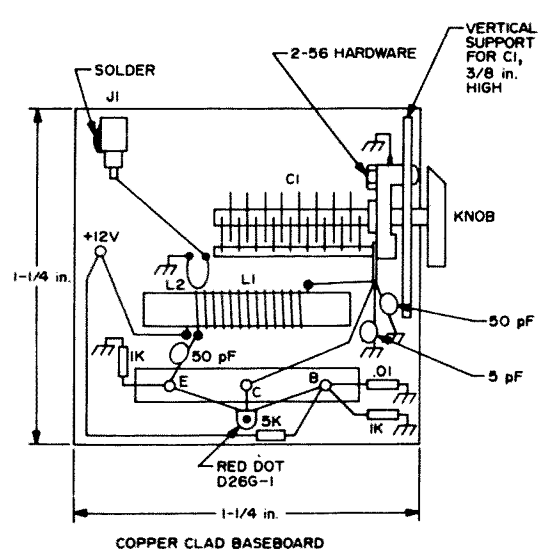


Fig. 2. Layout of the oscillator module. Note that L2 is over the cold end of L1.

Instability, where minute changes in circuit or device capacity can result in large and unwanted frequency changes. (c) Difficult padding and trimming due to the need for very small adjustments.

If, on the contrary, you start in with the idea of using maximum C, you will be much better off, so let's see how much can be used. A trial was made with an air-wound high Q coil, 7 turns of 5/8 in. O.D., 10 turns per inch. It worked fine, but hit 50 MHz with a small C, not allowing enough bandspread. A second coil had 6 turns of bare tinned No. 20, 7/16th in. long, tapped at one turn. Much better, very stable, uses about 75 pF of padding, but which, with the 20 pF variable chosen for tuning, covers only 1.5 MHz, which is not enough tuning range. The range is easily extended though by using a slightly larger coil. Checking on the maximum capacity that could be used and still have a good oscillator, one turn and then 2 turns were chopped off LI, at which time the rf power started to drop off, which indicates that between 75 and 100 pF is about it for this device and the dc power allocated to it for 6 meters. You could design a higher C oscillator if you had to, but in this case we're only looking for a good, general purpose L.O., not an extreme maximum C job.

Going to a 6 turn coil for LI, slightly closer wound, we find about 60 pF for 50 MHz, total capacity, and 2.5 tuning range with a 20 pF tuning capacity for C1. It is now a very good stable oscillator, with smooth power control and current adjustment with R1, so this looks like what we're after.

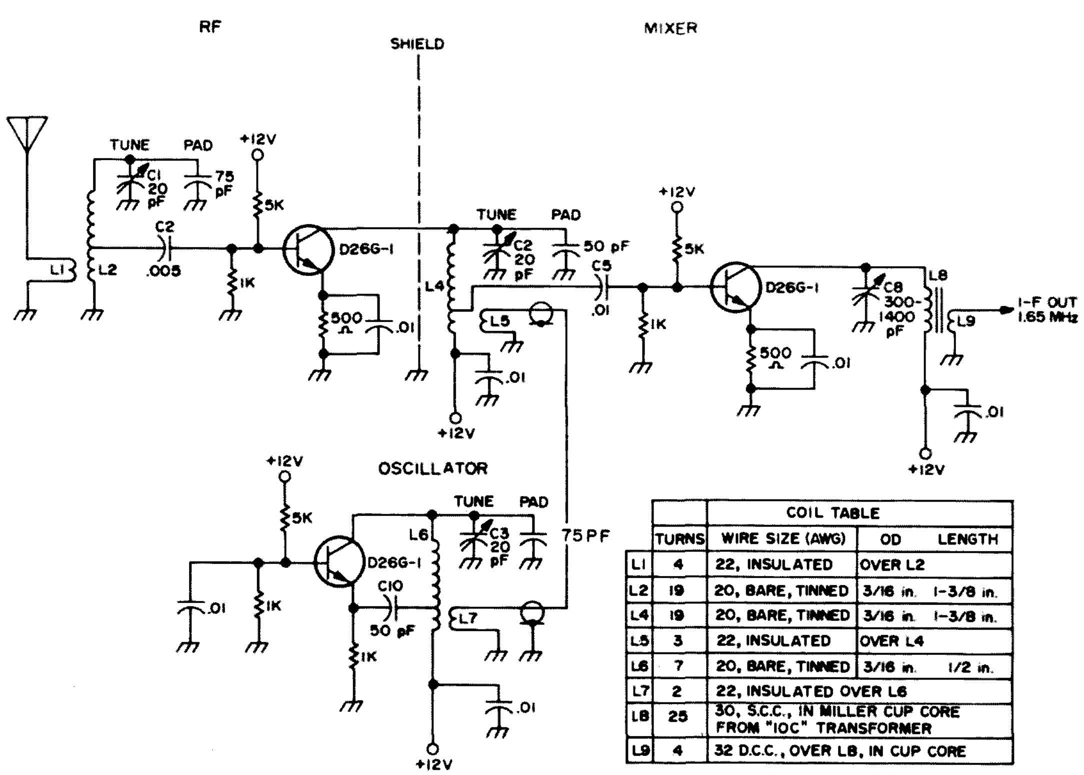
The choice of a 20 pF tuning capacitor was not just an arbitrary one. It is also the range of the Miller three-gang variable capacitor which may be used later.

Various values were tried for C10, of Fig. 3, the emitter feedback capacitor, and from 1000 pF down to near 40 the power increased and then dropped out below 25. A 50 pF was found to be best, and was installed at that point.

The final circuit is shown in Fig. 3, and the breadboard test layout in Fig. 4.

The Front End

At first, nothing seemed right with the exception of the oscillator and even that was undercoupled. This is far from an unusual thing though, with new rigs. You



	TURNS	COIL TABLE WIRE SIZE (AWG)	OD	LENGTH
L1	4	22, INSULATED	OVER L2	
L2	19	20, BARE, TINNED	3/16 in.	1-3/8 in.
L4	19	20, BARE, TINNED	3/16 in.	1-3/8 in.
L5	3	22, INSULATED	OVER L4	
L6	7	20, BARE, TINNED	3/16 in.	1/2 in.
L7	2	22, INSULATED OVER L6		
L8	25	30, S.C.C., IN MILLER CUP CORE FROM "IOC" TRANSFORMER		
L9	4	32 D.C.C., OVER L8, IN CUP CORE		

Fig. 3. Complete schematic for six meter front end using microtransistors (GE D26G-1).

take some new devices (new to you anyway) and hook them up to coils and other components in a circuit that worked well (on another band) and what happens? Zilch is what happens!

At this time go get a new cup of coffee and install a good signal in the band, not too weak, but not overloading either, and prepare for some hours or days of hard work. See also information in the rf stage section for details of a useful signal generator setup for this sort of work.

Points needing improvement were as follows, referring to Fig. 3. The oscillator was close to the frequencies needed, but proved to be undercoupled to the mixer base circuit. The mixer was undercoupled to the rf collector coil L4 with C5 being too small, and its emitter resistor was too large and L4 was too small, needing almost 100 pF to hit 50 MHz.

Also, the rf stage was far from its best, with L2 being too small, likewise C2, and the base was undercoupled to the input coil L2. The antenna was also too loosely coupled, and even the rf collector tap was too far down on L4. You might think it's a wonder that I heard anything at all with it, and you'd be exactly right. I didn't!

With the signal generator hooked up, some of the more glaring deficiencies were corrected and things began to perk up. Finally, with action showing in the mixer tuning, the usual gang on Six down in Massachusetts started booming in after breakfast, and the little microminiature specks began to shape up. Most of the low sensitivity seemed due to the low value of inductance I had put in and the small base coupling capacitors.

Don't forget, I was only running a single i-f stage with the front end, and this counts for a lot because every time I put the 1.65 MHz output into the lab receiver things sounded very powerful. This is a common fault when building converters. One tends to neglect absolute sensitivity (overall power gain) when using a high-power i-f. The single stage i-f on 1.65 MHz really makes you peak things up in the converter, with the result that you have a lively, matched, selective unit.

One of the items neglected when I first set up the converter was the fact that on ten meters I had been using a ten turn coil, but it had a powdered iron core inside and out which greatly increased the inductance. So, on Six, I pruned L2 and L4 carefully, for gain and selectivity, still keeping the highest possible C for padding in order to get the needed bandspread, and suppression of harmonic detection and birdies.

The Mixer Circuit

Referring again to Fig. 3, the collector output coil tuned to 1.65 MHz by C8 is a more or less standard coil and worked right away. Miller 9054 coils will do all right also at this point.

The emitter was securely bypassed to ground to prevent the mixer from taking off as an oscillator (it didn't), which can happen with a tuned collector, a partially open (not tied to ground) emitter, and base tightly coupled to ground at 1.65 MHz through a small link or tap at 50 MHz.

Table 1. Mixer base tap on L4 using a 9-turn coil, 5/8 in. diameter, for L4.

Tap Turns From Low End	Relative Volts
2	10
3	19
4	17
5	17
6	14

Table 2. Capacity to rf base (C2 of Fig. 3).

pF	Relative Volts
100	10
1,000	18½
5,000	19

Table 3. RF base tap using 19 turn coil as L2 in Fig. 3.

Number of Turns From Ground	Relative Volts
3	22
4	26
6	25
9	20

Table 4. Number of turns in antenna link coil L1 of Fig. 3.

Number of Turns L1	Relative Volts
2	20 (some oscillation in RP stage)
3	23
4	24½ (very stable)

Best emitter bias resistor was found to be 500Ω for the microtransistor D26G-1, with 5K and 1K supplying the base bias as usual. Voltages to ground while operating were as follows; collector 10½V, emitter 1.6V, and the base 2V.

A new L4 was installed, with the small diameter coil, 1/8 in. I.D., bare tinned No. 20, 1 3/8 in. long, with results as in Table 1. The parallel pad for L4 was now about 45 pF, which was a good value to start with. The tuning was sharp and clean, with no spurious or birdies, and already at 6:45 A.M. the mobile lads on Six were coming in from 60 miles away as I tuned up and down while checking the bandspread. That's one way to tune up a mixer and make it really work.

Tuning Up the RF Stage

The signal used for this work (and the mixer also) was my faithful old signal generator, with a piece of wire 4 ft long, horizontal, attached to the "High" output, and tuned to 50.2 MHz.

This was placed about 75 ft away, indoors (houses are large in N.H.), and with the 4 element six meter beam used on the front end for tests, pointed about 3/4 away from the generator. Be sure and check that the signal *is* coming in via the beam, otherwise you may falsify the results. As the rf stage input is one of the more difficult points, I always like to use the beam and 50Ω cable for a life-like test. With the above setup the dc signal out of the single i-f stage diode was about 1/10th of a volt, which is enough to tabulate gain with and yet not enough to overload any of the circuits.

The rf collector tap (see Fig. 3) was found to be best at the high end of L4, due no doubt to the relatively low impedance resulting from the high parallel capacity C4A and C4B. The rf base capacity was found to be best at a high value, the same as the mixer. Table 2 shows the trend.

Table 3 demonstrates the influence of the rf base tap on the tuned input coil L2. It is interesting to note the similarity of the mixer base and the rf base as far as matching impedance on tuned circuits. RCA in their detailed and well worked out application circuits section also attach considerable importance to this ratio of the base tap section of the coil to the remainder, so we're in good company.

Voltages while operating were as follows: collector 10.5, base 1.6, emitter 1.0 volt, relative to ground.

The 50Ω antenna cable was tapped at 2 and 3 turns, with a drop noticed at 1 turn, and some self-oscillation due to the light loading. With 4 turns of link coupling it

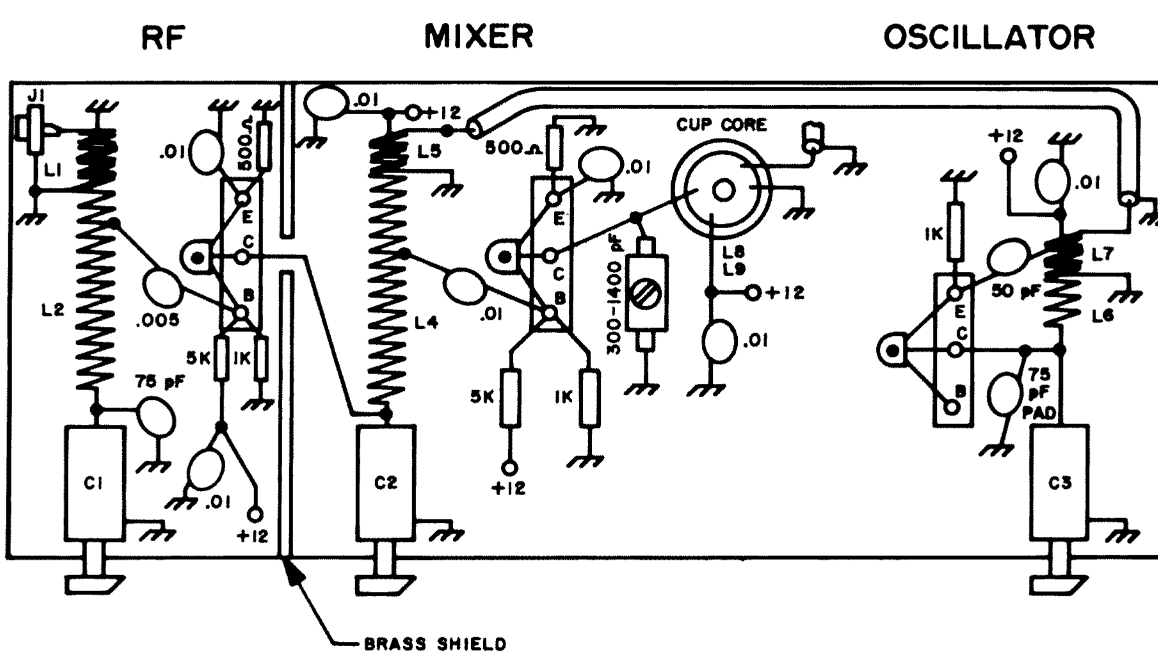


Fig. 4. Layout detail. Please add 5k to 12 V, .01 to ground to point B of oscillator.

was very stable and tuned well as shown in Table 4. This is always nice because it takes up little space, is easily adjusted, and doesn't cost anything. You also avoid more trimmers, which are quite large compared to the transistors being used. You have to be sure it's working though. You don't always get the best match with such a link.

A final trim-up of the oscillator input link L5 placed its three turns of L4 from ground for the best sensitivity.

The lab receiver was then connected for a check, tuned to 1.65 MHz as an i-f and plugged into the mixer output. Absolutely everything on the band could be heard and separated in fine style.

Results

After all the pruning and peaking up shown in Tables 1 through 4, plus other little things, I now have one of the best and most economical receivers for Six I've ever used. Still running the single i-f stage on 1.65 MHz I can hear anything that moves on the band. There are some very small coils suitable for 1.65 i-f and filter work, but more on that later. The rf input tuning is particularly nice peaking right up on frequency with good symmetry in the resonant tuning curve. I still find something definitely advantageous and different about those little GE gems as compared to the larger transistors used in the past.

At any rate, you have here a good sensitive, selective, six meter front end, with pocket size possibility.

Have another laugh on me . . . just a small one, but it might hit you too some day. Tuning up a single transistor af oscillator to modulate a test signal, I ran into trouble and changed the Motorola transistor that was in it, one of those little black plastic ones. The second one didn't work either (I hasten to say that both those units were perfectly good) so I checked the collector volts which were 12 on the meter, the base volts which were 2 to 3, also ok, but no emitter volts or current! Nothing I could do brought any current through the emitter or showed any bias volts. Finally, I just happened to look at those little silver colored tiny letters on the plastic case and found I was using a HEP56 instead of a 55. The 55's are my choice for a "Universal" device, and I've put nearly 4 dozen of them into circuits in the last several months and they all worked well. Figures 5A and B show what was happening. I had been applying dc bias to the emitter instead of the base. So keep your eyes open and maybe it won't happen to you.

This six meter front end using microminiature transistors in a breadboard circuit with all small components and their best values determined, and working like a charm, is now ready for packaging, but small!

It is intended that two stages of 1.65 MHz i–f, with avc, will be tuned up using these little devices also, and packaged to match in size. As you can see by the module example, one stage including the variable capacity has been packaged ½ in. thick by 1¼ in. square, not counting the tuning knob. This indicates a possible pocket rig some 1½ in. high, 1½ in. wide, and 4 in. long. Battery, mic, speaker, and antenna yet to come. This is using 4 stages in the transmitter and about 8 in the receiver. Maybe it will take an overcoat pocket just now, but at least you can see where we're heading.

. . . K1CLL

AN EMERGENCY TRANSFORMER

How many times have you discovered a dead transformer just as sked time neared? And then found it was the primary of the transformer that had opened.

This happened to me a few weeks ago, and not having another suitable power transformer handy, I solved the problem by bringing into use an old junkbox job with a hefty low voltage secondary. This was hitched to the heater winding of the main transformer – and so fed the tubes direct as well as supplying B-plus. The actual output of the junkbox transformer under load was a trifle too high, so a wirewound resistor was put in series with the primary, and adjusted until the heater voltage was just over 6.3 volts. Although this was only a temporary lashup to get me on the air, it's been going fine for several weeks now, with no sign of smoke. It would appear to work with any main transformer which has a definite open circuited primary – but not, of course, one with shorted turns.

. . . **G3KPO**

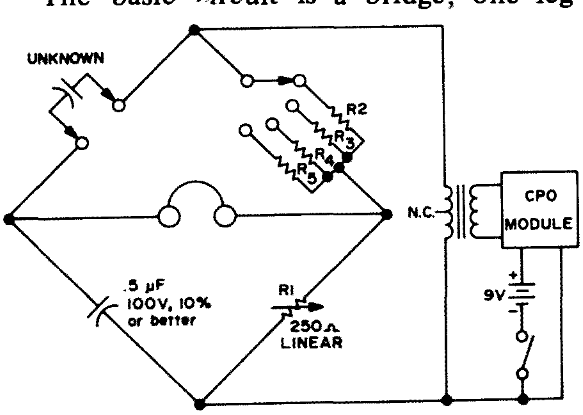
BUILD A BASIC BRIDGE

William P. Turner WAØABI
5 Chestnut Court
Saint Peters MO 63376

Occasionally the Novice or casual amateur requires the use of a capacitor checker while in the process of building or repairing his equipment. The frequency of this need is often such that the purchase of a kit or commercial checker could not be justified. Over the years many homebrew models have been presented in the various electronic magazines, but these are apt to be too expensive or too complicated to fill the need.

Presented here is a cheap, easy to construct checker which will measure capacitors from .0001 to 1.0 μF in four ranges with about as much accuracy as the builder might desire. While not covering a wide range of capacitance, it will check 90% or more of the capacitors found around the shack. The normal "entertainment" grade resistors, capacitor and poteniometer will do nicely . . . on the other hand, accuracy may be greatly increased if precision components are used and precision calibration undertaken.

The basic circuit is a bridge, one leg being a switch selected range resistor, the second a 250Ω variable element, the third leg a .5μF "standard" capacitor, and the fourth, the unknown. When the ratio of the unknown to the standard equals the ratio of R1 to R2, R3, R4, or R5, the bridge is in balance and no audio output appears across the null detector terminals.



RESISTOR	SCALE
R2 - 100K	X 100 pF
R3 - 10K	X 1000 pF
R4 - 1K	X .01 µF
R5 - 100Ω	X .1 µF

ALL RESISTORS - 1/2W, 5% or better

Fig. 1. Transformer shown is 500ct:8Ω.

The bridge is supplied with audio voltage by a packaged "code practice oscillator" module (in this case a Cordover CPO-4) of the 98¢ variety fed through a 79¢ transistor output transformer running backwards for impedance matching purposes. A similar homebrew oscillator could be used if desired. The null detector may be as simple or complicated as you have available. A pair of earphones, an amplifier,

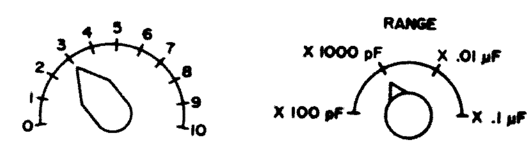


Fig. 2. Suggested method of calibration.

an ac VTVM, or a scope are usable. Phones are quite satisfactory and have the advantage of being readily available in the average shack.

Calibration consists of nulling the bridge with a known value capacitor across the unknown terminals and marking the scale at that point. Continue until the 1 through 10 positions have been located, changing or paralleling capacitors as necessary. It is not necessary to calibrate each range separately. The range resistors will insure that the scales are not too far from being exact multiples ot the basic range. It will be noted that with the specified potentiometer the scale will cover only about 180° of shaft rotation. If desired, a 150Ω pot could be used and the scale expanded to cover a full 270°.

The unit as originally constructed used a rotary switch to control the oscillator battery. If you are the forgetful type, a normally open pushbutton may be substituted in the interest of conserving the battery.

. . .WAØABI

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NA3026	Dual Diff. Array	12-TO5	0.99
NA3086	5-Trans. Array	14-DIP	0.45
NA3036	Dual Darlington	10-TO5	0.75
NA1595	Analog Multiplier	14-DIP	1.90
NA8038	VCO/Sine/Sq./Tri.	14-DIP	4.50
NA1596	Bal. Mixer/Mod.	10-TO5	1.20

NA376	Voltage reg., pos. low stdby.	8-DIP	1.25
NA723	Voltage reg., pos/neg.	10-TO5	0.99
NA741	Op. amp.	8-DIP	0.45
NA1303	Stereo preamp	14-DIP	0.99
NA1304	Stereo multiplex decoder	14-DIP	1.20
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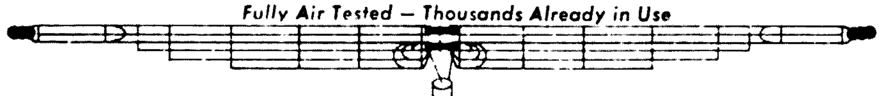

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Part 3

The concluding part of this series covers the remaining functions such as the sidetone, transmitter keyer, power supply, and others necessary to complete the keyer.

Sidetone

Fig. 14, is the schematic of the sidetone oscillator and buffer to drive the speaker. The spare gates from Fig. 5, and from Fig. 8, are used in the sidetone circuit. The oscillator is adjusted for approximately 1 kHz. Each time OUTPUT goes high the oscillator is turned on. I originally used CMOS buffers instead of Q1 and Q2 and the circuit had adequate volume but no reserve. Now there is plenty of drive for the speaker and although I haven't tried it, the volume control could be connected to the unregulated 16V for even more output. Any NPN transistor from your junk box should work for Q1 and Q2.

Transmitter Keyer

I currently have a Heath SB-101 transceiver which uses grid block keying, keying about -60V at 1 to 2 mA to ground. I decided to use an optical coupler to interface with the transmitter. (An optical coupler has a LED and a photo transistor in it. When current flows through the LED, it emits light. The light striking the base region of the photo transistor causes the transistor to turn on.) Since the voltage rating of the optical coupler transistor is only 30V, I use it to drive a high voltage PNP transistor for keying the transmitter. The circuit provides about 1 mA of base drive to the keying transistor, Q3. I used a D cell flashlight battery to provide the negative voltage for turning on Q3. A negative voltage could be generated from the ac power supply, but I decided that I may want to operate the keyer from an external battery some day for portable operation and then it would have required two external batteries. Only 1 mA is drawn from the flashlight battery during key down conditions and the battery should last for shelf life.

A small amount of rf interference was noted the first time the keyer was connected to the transmitter. C1401 cured all of the problems but I added a few extra for

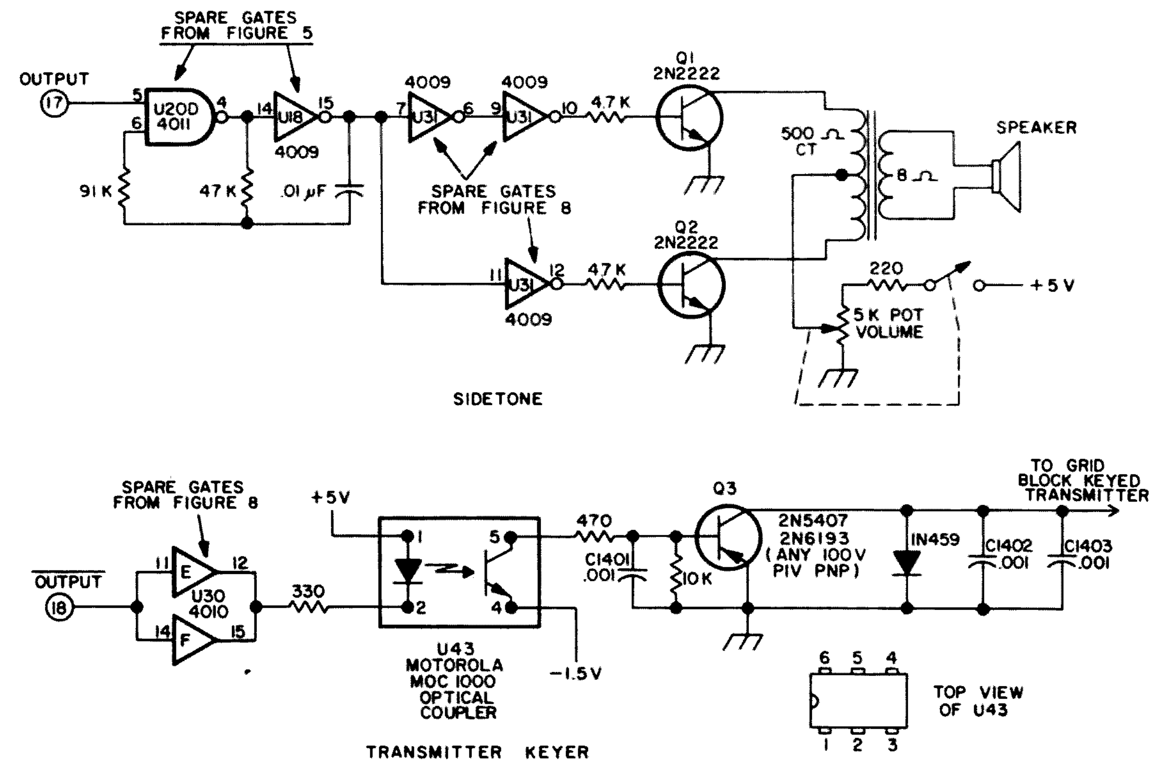


Fig. 14. Sidetone and transmitter keyer.

insurance. Install C1402 near Q3 and install C1403 at the panel jack that goes to the transmitter. I have found when digital circuits are operated near high power transmitter a handful of bypass capacitors installed on input/output lines is always worth the time and effort.

Other methods of keying the transmitter could be incorporated such as a reed relay, NPN transistor or whatever you desire. Gates U30 E and F, connected as a pair, are capable of sinking about 8 to 10 mA to ground, or sourcing 1.5 to 2 mA of current. If you decide to drive a relay use a buffer transistor.

Display

A four digit display (see Fig. 15) is used in the keyer and the numbers are displayed in octal or base 8 format. The first 3 address lines go to the units display. Address lines 4, 5 and 6 go to the tens display. Address lines 7, 8, and 9 go to the hundreds display and address line 10 goes to the thousands display. As the address counter counts up from zero, the address lines will advance in a binary mode. The units display will count from 0 to 7. The next count is 8, with address line 4 high and 1 through 3 low. Line 4 makes the tens display read 1 and lines 1, 2, and 3 make the units display read 0. So we see 10 not 8 on the display. If you haven't worked with octal numbers before it may seem confusing at first, but it is a very convenient way of handling binary numbers. There are 1024 locations in memory or 0 to

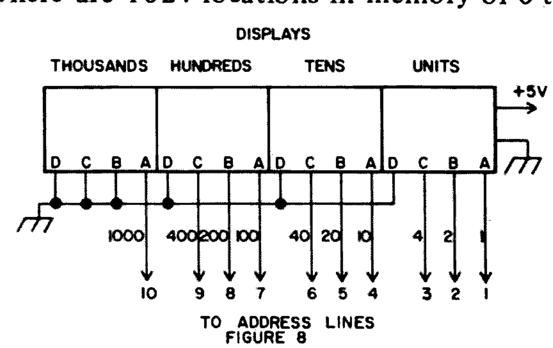
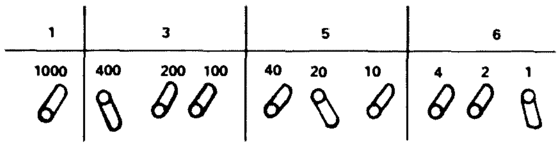


Fig. 15. Display wiring.

1023 decimal. The display will read from 0 to 1777. Don't even try to convert back to decimal when jotting down a starting address from the display. If the display reads 1356, write down 1356. If you group the address selection switches in groups of 3 with a little

separation between groups, each group of three is an octal digit. To obtain 1356 set the switches to:



The buffers on the address lines can drive about 3 TTL loads. Even with both PROMS installed that leaves enough drive for the displays. Any display, seven segment incandescent, LED (light emitting diode), or nixie type can be used with its appropriate decoder/driver provided the decoder/driver has TTL compatible inputs. There are many of these currently available on the market. Ten individual light bulbs could also be used provided some sort of transistor driver is incorporated. I use seven segment incandescent displays in my keyer.

Address Selection Switches

Fig. 16, shows two options for wiring the address selection switches. Fig. 16a, is the simplest way and just requires 10 switches. Space them in 3 groups of 3 and a single one as mentioned before. Having seven sequences programmed in PROM I decided it would be nice to have a single rotary switch to select any one of the seven starting locations. Fig. 16b, shows how this was done. You must first decide on what you are going to program in PROM to determine the needed starting locations. Then you can set up the diode matrix for those locations.

CMOS-TTL Compatability

CMOS logic can be operated over a voltage range of 3 to 15V, unlike TTL which is 5V ±5% for commercial temperature range. The memories I have selected operate at 5V and since the PROM is a TTL device, the entire keyer is operated at 5V. TTL devices can be used in CMOS circuits provided a pull-up resistor is used on the output of any TTL device driving a CMOS device. This insures that logic 1 output levels are approximately 5V instead of only 3.3V, typically, which is adequate for a TTL logic 1 level. CMOS gate outputs switch logic levels when the input passes through a voltage level equal to approximately 45% to

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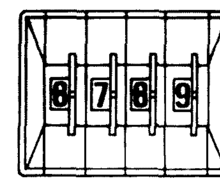

All switches are black with white figures and snap-in front mounting.

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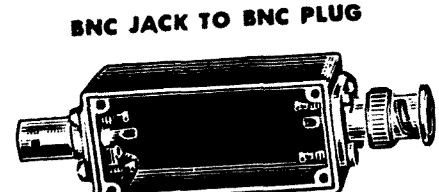

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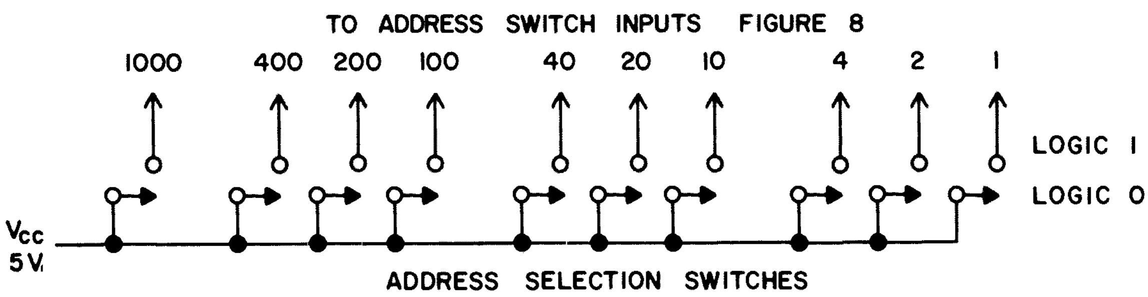
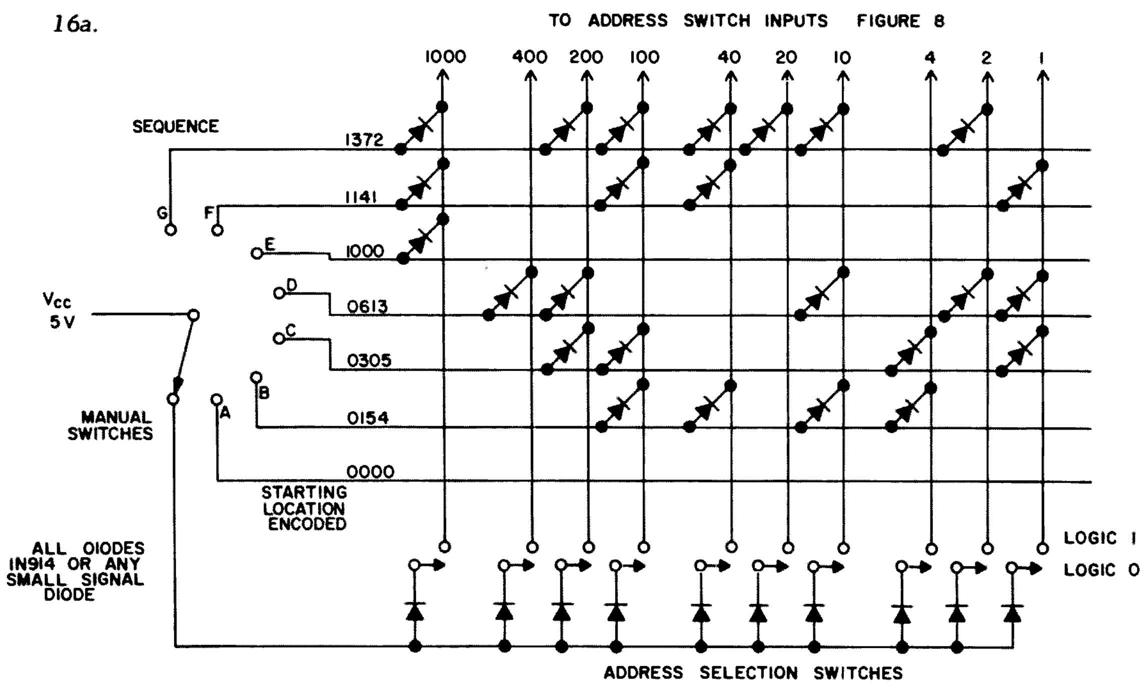


16a.



16b.

Fig. 16 a and b. Two methods for wiring address selection switches.

55% of the supply voltage for the CMOS gate, that is a low input should be less than 45% of the supply voltage, and a high input should be greater than 55% of the supply voltage. For safe designs a low input should be less than 30% of the supply voltage or less than 1.5V at a supply of 5V. A high input should be greater than 70% of the supply voltage or greater than 3.5V at a supply of 5V. The pull-up resistors on the output of the memories and the PROMS insure a good logic 1 input to the CMOS multiplexer.

Power Supply

The CMOS logic in the keyer draws about 2 mA. The various pull-up/pull-down resistors draw several mA depending on the position its associated switch is in. The two RAMS draw 30 mA each, and each PROM draws 80 to 100 mA. The sidetone draws about 20 mA at maximum volume. I used seven segment incandescent displays which draw a total of 700 mA. The total current requirements for the keyer is about 1A, but this is largely dependent on the displays used. A switch could be installed in the display power lines to conserve power when operating from battery. The power supply Fig. 17, uses a 24V filament transformer and a three terminal monolithic 5V regulator. This type of supply has appeared many times in current publications.

Construction

The keyer can be fabricated any way the builder desires. I built mine into a 15.24 x 17.7 x 25.4 cm box. Keep leads as short as possible and use a single point ground and a single point 5V connection from the supply. Run a separate ground and 5V line to each

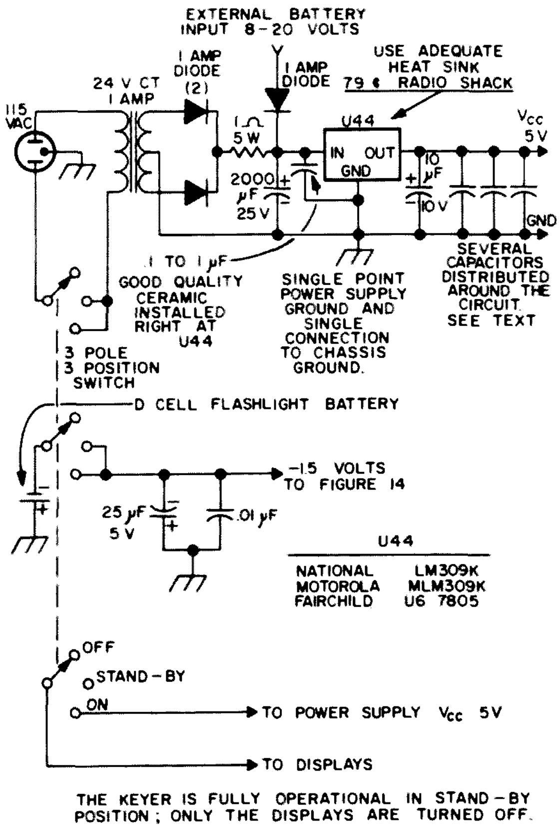


Fig. 17. Power supply

card or group of ICs, and run a separate ground and 5V line to whatever displays you choose. Use some .001 μF capacitors as bypasses from 5V to ground on each card or group of ICs. A couple of 10 to 50 μF capacitors sprinkled around will always make digital circuits quieter and never hurt.

If you counted the ICs on the two cards in the photographs you came up with 40. However, the schematic shows 42. CD4035, 4 bit shift registers can be used as quad D flip-flops, and 2 of these could replace 4 CD4013 dual D flip-flops. But since the Q and Q BAR outputs are not both available, other substitutions and rearrangements must be made. Because of the diffiuclty in splitting a complex device, such as the 4035, over several schematics, and the confusion it might create, I decided it was best in the long run to add two chips to simplify things. Also, the sidetone was modified after the pictures were taken, so you won't find Q1 or Q2, either.

PROM Coding

Figure 18 shows the coding in my PROM to call CQ. The sequence programmed is CQ CQ CQ DE W1GCA W1GCA W1GCA (re-

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MC1458 Dual 741 OP AMP (MINI-DIP)	$ .95
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1N4608 TYPE GP & SW 80V/400mA	6/$1.00
1N3893 TYPE RECTIFIER Stud Mount 400 V/12 A	2/$1.00
1N749 ZENER 4.3 Volt 400mW	3/$1.00
1N753 ZENER 6.2 Volt 400mW	4/$1.00
1N755 ZENER 7.5 Volt 400mW	4/$1.00
1N757 ZENER 9.1 Volt 400mW	4/$1.00
1N758 ZENER 10 Volt 400mW	4/$1.00
1N965 ZENER 15 Volt 400mW	4/$1.00
1N968 ZENER 20 Volt 400mW	4/$1.00
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	OP-CODE BITS						
	A	B	A	B			
PROM WORD	OUTPUT BITS				CODE		
	1	2	3	4			
1	1	0	0	1	–	•	C
2	1	1	1	0	LS	–	
3	1	0	0	1	–	•	
4	1	0	0	0	–	WS	Q
5	1	0	0	1	–	•	
6	1	0	0	1	–	•	C
7	1	1	1	0	LS	–	
8	1	0	0	1	–	•	
9	1	0	0	0	–	WS	Q
10	1	0	0	1	–	•	
11	1	0	0	1	–	•	C
12	1	1	1	0	LS	–	
13	1	0	0	1	–	•	
14	1	0	0	0	–	WS	Q
15	1	0	0	1	–	•	
16	0	1	1	1	•	LS	D
17	0	1	0	0	•	WS	E
18	0	1	1	0	•	–	
19	1	0	1	1	–	LS	W
20	0	1	1	0	•	–	
21	1	0	1	0	–	–	
22	1	0	1	1	–	LS	1
23	1	0	1	0	–	–	
24	0	1	1	1	•	LS	G
25	1	0	0	1	–	•	
26	1	0	0	1	–	•	C
27	1	1	0	1	LS	•	
28	1	0	0	0	–	WS	A
29	0	1	1	0	•	–	
30	1	0	1	1	–	LS	W
31	0	1	1	0	•	–	
32	1	0	1	0	–	–	
33	1	0	1	1	–	LS	1
34	1	0	1	0	–	–	
35	0	1	1	1	•	LS	G
36	1	0	0	1	–	•	
37	1	0	0	1	–	•	C
38	1	1	0	1	LS	•	
39	1	0	0	0	–	WS	A
40	0	1	1	0	•	–	
41	1	0	1	1	–	LS	W
42	0	1	1	0	•	–	
43	1	0	1	0	–	–	
44	1	0	1	1	–	LS	1
45	1	0	1	0	–	–	
46	0	1	1	1	•	LS	G
47	1	0	0	1	–	•	
48	1	0	0	1	–	•	C
49	1	1	0	1	LS	•	
50	1	0	0	0	–	WS	A
51	0	0	1	0	WS	–	Repeat
52	0	1	1	0	•	–	K
53	0	0	1	1	WS	LS	Stop

OP-CODE BIT

A	B	CHARACTER
0	0	Word Space – WS
1	0	Dash
0	1	Dot
1	1	Letter Space – LS

WS/WS = Repeat

WS/LS = Stop

Fig. 18. Example of PROM coding to send CQ.

peat)K (stop). This will serve as a guide if you decide to install PROMS in your keyer. The logic levels are the same as they have been all through the discussion of MOSKEY; a high = logic 1 = 5V, a low = logic zero = 0V. Unfortunately some PROM manufacturers use this logic definition on the address lines and inverted logic on the outputs; a logic 1 = 0V, and a logic zero = 5V. Be sure you understand it for whatever PROM you use. Murphy's Law says you have a 50% chance of programming the PROM with the outputs inverted. I have seen PROMs programmed with the outputs inverted even after checking and double checking spec sheets. If by some fulfillment of Murphy's Law your PROM outputs are inverted, don't fret. You don't have to throw it away. A couple of inverters on the PROM outputs if using 256 x 4's or on the first level mux outputs if using 32 x 8's can correct it. But if you did it wrong the first time and add a second PROM, do it wrong the second time. Otherwise you'll have inverters on the first PROM and not on the second, etc., and it could get to be a confusing mess.

Operation

When the wiring is all completed and double checked, turn on the power. Usually one dot and one dash will be outputted when the keyer is turned on. Capacitors C301, C302, C303 and C304 cause the dot and dash latches to get set when power is turned on. To operate the keyer as a normal IAMBIC keyer, just plug in your squeeze paddle (or regular paddle) and send. Don't become discouraged if you're trying squeeze keying for the first time and find it difficult. I practiced for about three hours before I felt confident enough to put it on the air, but then the results are fantastic. The ease of squeeze keying combined with letter and word spacing will give you a fist to be proud of.

To program the keyer select a starting address and press the PRESET button. The displays will read the address selected. Turn on the PROGRAM switch and send your favorite sequence on the key. When you have completed sending press the STOP STORE button to store away a stop in-

struction. Turn off the PROGRAM switch. Press the PRESET button again to set the memory address counter back to the beginning of the sequence and press the START switch. The keyer will send your sequence and stop at the end of it.

Sequences can be loaded anywhere in memory. Write down the starting location of each so you can keep track of them and select the one you want at the right time. It's better to store them sequentially one after another so you don't accidentally program over something already stored away. Also if a sequence is being programmed near the end of memory and eventually gets to the last location of memory, the address counter will overflow back to location zero and the keyer will continue on. If something was already stored at the beginning of memory it will be written over and lost.

To use the repeat feature first decide what you want to send and which part you want to repeat. For example, to have the keyer send CQ DE W1GCA CQ DE W1GCA K (stop) program it as follows: Select a starting location, say 1000. Press the PRESET switch and turn on the PROGRAM switch. Send CQ DE W1GCA. (Display reads 1046, right?) Press the REPEAT STORE switch and then send the letter K. Press the STOP STORE switch, and turn off the PROGRAM switch. (Display reads 1054). Press the PRESET switch to set the memory address counter back to location 1000. The address switches must be left at 1000 when sending the sequence for it to come out properly. Press the START switch and the keyer will send CQ DE W1GCA CQ DE W1GCA K (stop).

One other feature the keyer has, although I haven't found a very practical use for it yet, is to cascade two sequences. You can have the keyer send a message and by use of the repeat instruction have the keyer jump to another message. Start at location 0000 and program HI. The display reads 10. Press the repeat store switch. Now select another address, for example, 50. Press the preset button and program in GANG. The display reads 66. Press the stop store switch and take the keyer out of programming mode. Select 0000 on the address switches and

Signal number	Signal name	Used on figure number 3	5	8	13	14
1	CLOCK	x	x			
2	CLOCK2 BAR	x	x			
3	EOI•CLOCK2	x		x		
4	EOI•CLOCK BAR	x		x	x	
5	KEY DASH IN PROGRESS	x			x	
6	KEY DOT IN PROGRESS	x			x	
7	KEY DOT + KEY DASH IN PROGRESS BAR	x		x		
8	MEMORY WS NEXT OP CODE	x		x	x	
9	MEMORY LS NEXT	x	x	x		
10	MEMORY DASH NEXT	x		x		
11	KEY WS NEXT BAR	x		x		
12	MEMORY WS NEXT NEXT BAR	x		x		
13	RUN	x	x		x	
14	KEY NEXT	x		x		
15	WSFF + LSFF	x		x		
16	EOI DELAYED BAR	x		x		
17	OUTPUT	x				x
18	OUTPUT BAR	x				x
19	WSFF	x	x		x	
20	KEYMODE FF	x		x		
21	CLOCK2		x	x		
22	CLOCK BAR		x		x	
23	STOP NEXT BAR		x	x		
24	STOP + REPEAT STORE BAR			x	x	
25	REPEAT SKIP BAR			x	x	
26	RAM A INPUT			x	x	
27	RAM B INPUT			x	x	
28	PRESET			x	x	

Fig.19. Final assembly figure interconnection check list.

press the preset button. Now select 50 on the address switcher but do not press the preset button. Press the start switch and the keyer sends HI. Then it comes to the repeat instruction and presets the counter to the address selected by the switches, which normally should be the starting location for the message being sent, but in this case it isn't. Instead of repeating HI, the keyer goes to memory location 50 and continues on to send GANG, and then stops. You can only do it once though, because the REPEAT FF gets set and any further repeat instructions are ignored.

Conclusion

The keyer has added a new dimension to CW operation and using it on the air has certainly been a pleasure. I find myself programming little short phrases into it to have at instant recall whenever I want to send them. All comments received on the air have been favorable as to the keyer's timing of characters and spacing of characters. I think it competes with W1AW's code practice machine! . . . W3HPX

Robert Suding WØLMD
370 South Queen Street
Lakewood CO 80226

August 73 Scan Converter Update

The following changes are to be made in the camera scan converter article which appeared in August, 1974 issue of 73 Magazine.

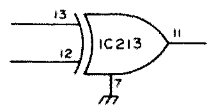
Significant Text Errors:

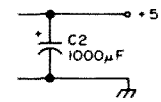
Page 77 Right column Line 8: ≈MHz should be ≈5MHz Page 80 Line 29: TP14 should be TP13.

Parts List:

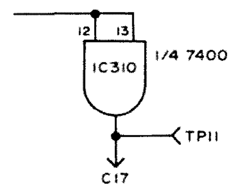
C105, C301* should be .001 Silver Mica
C107 should include 4.7mfd, 10v tantalum
C109* should be .0033 Mylar (.003 ok, though.)
C210, C202, C203 should read C201, C202, C203
C204, C205 should be 560 pf silver mica
C206*, C207* should be 47 pf silver mica
C209* should be a 800 pf silver mica
C302 is a .1 mfd Mylar
R1 is 200K
R2, R4 are 100K chassis mounted pots
R3 is 470K
R101 is 1.5K
R111▲, R113, R126 should be R111▲, R113, R306
R302, R306 should be only R302
Add: R308. . .390Ω

In addition:





Move TP11 from the present location to:



Scope Patterns:

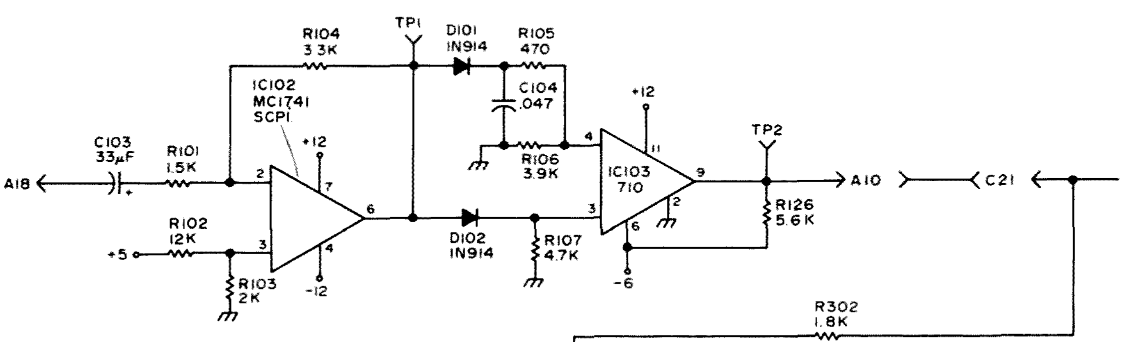
The first dual trace pattern on page 78, showing TP21 and TP22 should read " - trigger".

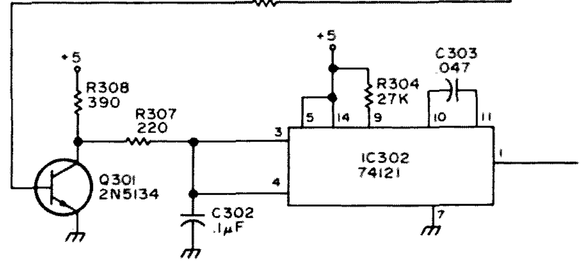
Misc.

In the "volts" box of the bypass table on page 83, insert " -6" in the blank box between +12 and -12.

The following list of IC functions was edited out of the schematic. This list may be of use to your understanding of component functions.

IC101 – White and Black Compression
IC102, IC103 – Sync stripper
IC104 – D/A Converter
IC105 – LPAF and D/A Amplifier
IC106 – VCO





Schematic:

Due to a last minute engineering change, some drawing confusion resulted in schematic errors at the bottom left of page 82. Redraw this portion to appear as shown.

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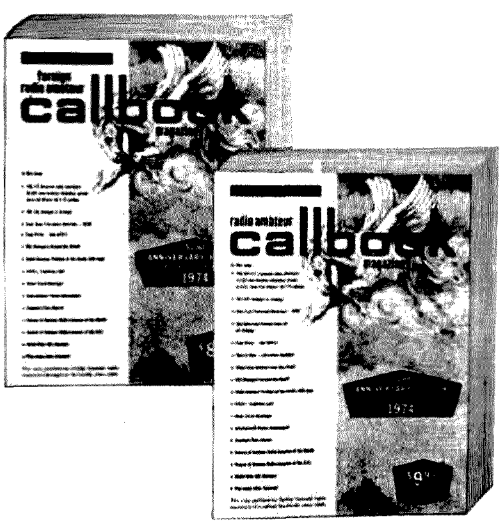

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IC214 – Reverser
IC215 – Video/Gray Scale Multiplexer
IC216 – 2 Phase Clock Driver
IC301, IC302 – Sync Separator
IC304 to IC306 – Vertical Counter
IC307, IC308 – Line Sample Selector
IC309 – 8-8.5 Seconds Gate
IC311 – Horz Sync Singleshot
IC312 – Vert Sync Singleshot

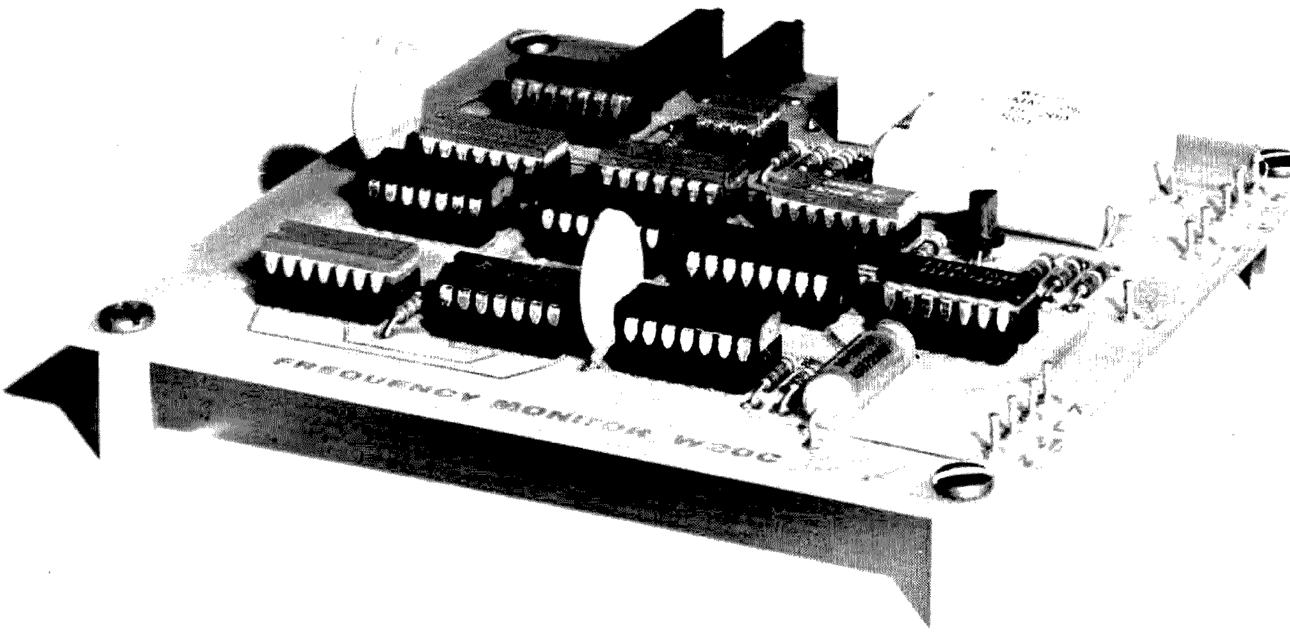
Several foreign hams have noted a picture foldover problem when operating from 50Hz lines. A "fix" is being investigated and will be reported later.

Jacking the Galaxy Transceivers

The earlier Galaxy III and V transceivers have no provision for using a pair of high-impedance headphones. These transceivers just happen to have a hole in the back panel for use with a remote vfo – you are supposed to run a length of coax through this hole to the phono jack that is mounted on the side of the vfo enclosure. Not many hams use a remote vfo with their transceiver, but more would like to use a set of high-impedance headphones instead of the speaker.

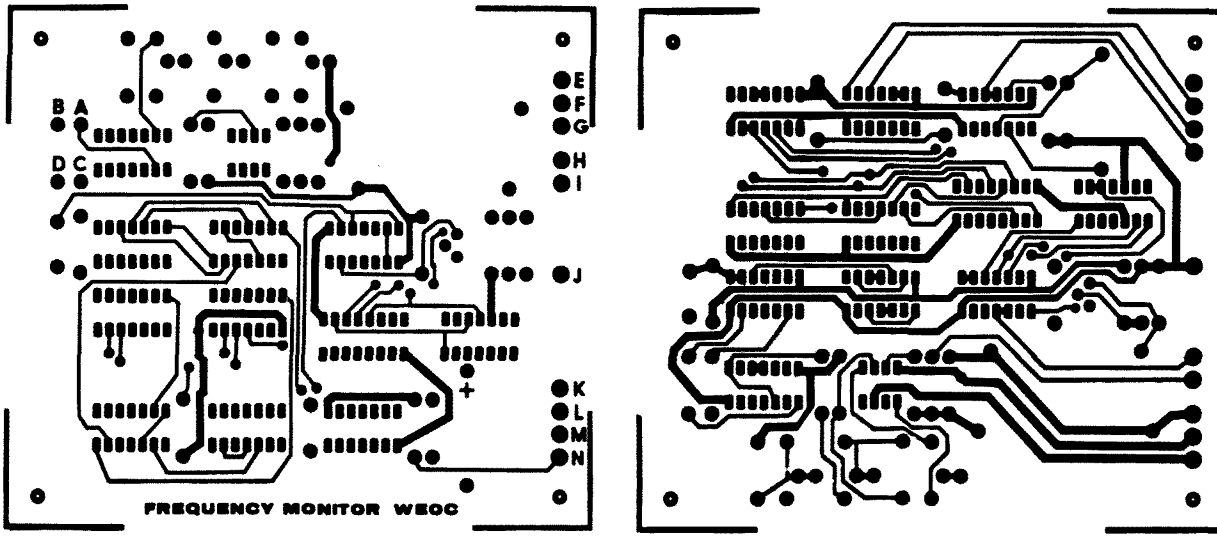
It just happens that a standard phone jack receptacle will fit into this hole very handily. A plate-to-voice coil audio output transformer will fit into the case of the Galaxy quite easily. I mounted mine under one of the screws holding down the cover of the vfo enclosure. The transformer's high impedance leads are connected to the newly-added phone jack and the low impedance leads are connected to the speaker jack that Galaxy provided on the back panel. You can use your high impedance headphones with the transceiver instead of the speaker, and when trading time comes, the jack and the transformer can be removed with no marks remaining to tell the dealer you had modified the transceiver.

. . .WB6PKA



Beep-Beep-Beep-Beep, You're High

Digital unit to automatically tell repeater users whether they are high or low in frequency. What self-respecting repeater group can pass up this bit of frosting?

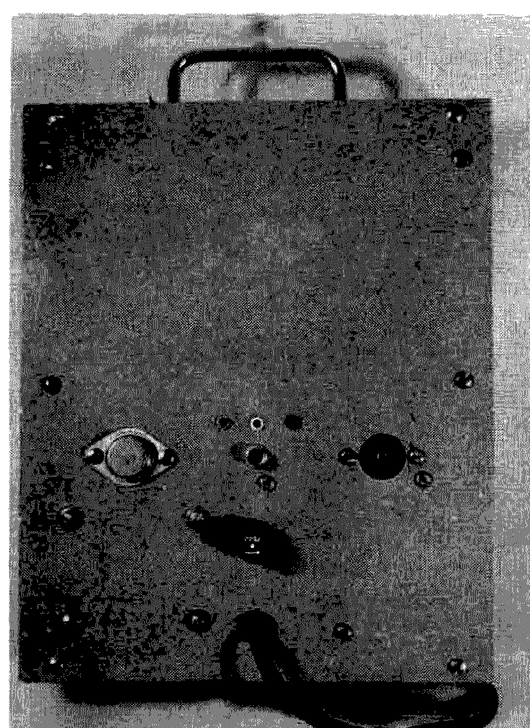


Front and back layout of the board — one half size here.

Bill Fisher W2OC
2 Barnard Road
Armonk NY 10504

One of the most common adjustments that operators on FM repeaters find necessary to make, at one time or another, is the crystal trimming adjustment required to set their transmitters "on frequency." Most hams prefer to use a frequency counter to accomplish this, but although these instruments are increasing in number in ham shacks every day, they are still not readily available to the majority of operators. The alternative method of frequency adjustment usually employed is to be "talked on" frequency by someone at the receiver site watching a discriminator meter. This assistance, unfortunately, is not necessarily available very often or at a convenient time. The frequency monitor to be described here was designed to enable an operator to set his transmitter on frequency without the need for either a frequency counter or outside assistance. Furthermore, once this adjustment is made, the frequency monitor will continue to provide a constant check on it and automatically indicate if, and when, further adjustment is required.

The frequency monitor is installed at the repeater, connected to the input frequency receiver, where it continuously monitors the output of the discriminator. When it detects a received carrier which is removed from the center frequency by a given amount, it signals this to the digital circuitry and also indicates whether the carrier is above or below the center frequency. This information is *temporarily stored* by the monitor *until* the carrier is removed from the receiver input. At that time the information is then transmitted by the repeater input. At that time the information is then transmitted by



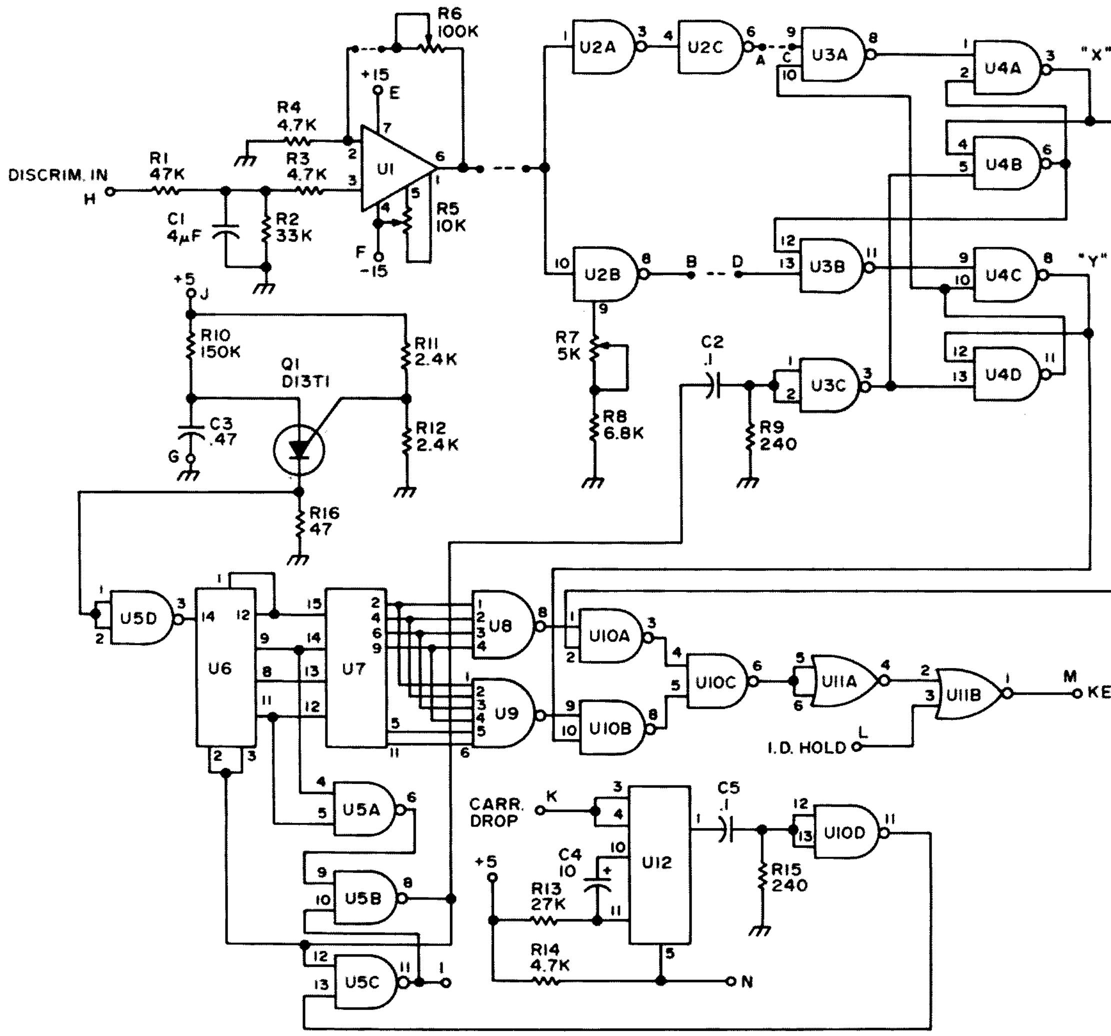


Fig. 1. Schematic of the high-low frequency monitor.

the repeater in Morse code in the form of a letter "H" or a letter "L" if the signal was high or low with reference to the center frequency. If, however, the received carrier at the repeater is within a frequency "window" (± 750 Hz from center), no Morse letter will be sent. The operator, therefore, merely has to adjust the crystal trimmer until he no longer hears an "H" or an "L" when he releases his push-to-talk button, indicating that he is within the "window." This frequency window is adjustable to whatever limits are desired, but the ± 750 Hz spread used at WR2ACI, White Plains, N.Y., has been found to be a practical figure.

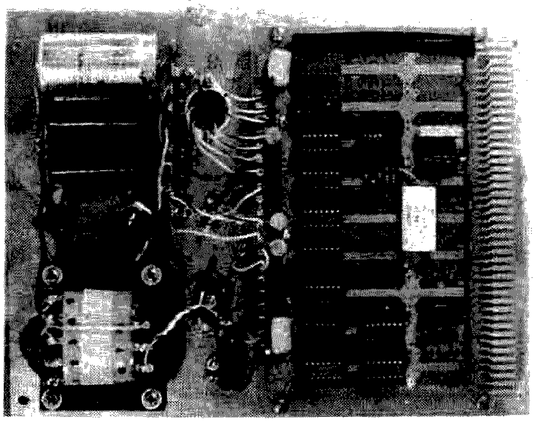
The frequency monitor is designed to have its output key the same audio oscillator used for the repeater I.D. It also requires two logic signals normally present in I.D./control circuitry. They are: (1) a so-called "carrier drop" signal which falls from a high (>2.4 v.) to a low (<0.8 v.) whenever a carrier *is removed* from the receiver input, and (2) a so-called "I.D. hold" signal which remains high *during* the I.D. Referring to Fig. 1, operation of the circuit is as follows: The output of the receiver discriminator is connected through R1 and R3 to the non-inverting input of U1, a 5556 op amp. (Note: The point of connection at the receiver is the same one ordinarily used for a zero-center microammeter.) The discriminator output is amplified by U1 and appears at pin 6. This bi-polar (i.e. positive and negative) signal at pin 6 is then presented to U2, pins 1 and 10. U2 is a 1489 which has four identical sections and is specifically designed to accept bi-polar signals and convert them to zero and +5 volt logic levels. Each section can be individually adjusted to

a specific positive or negative threshold level and in this case one section (U2A) is set for a positive threshold of approximately 1.2V and another section (U2B) is adjusted for a negative threshold of equal value. A third section (U2C) is merely used as an inverter. (The fourth section is not used). Let's assume that a carrier is received which is just outside the high frequency limit of the window (i.e. 750 Hz high) and that this produces a positive voltage swing. The gain of U1 would then be adjusted (by means of R6) so that, under these conditions, pin 6 would just reach the threshold level of U2A (approximately +1.2 volts). When U2A sees this level, its output (pin 3) drops abruptly from a high (approximately +4V) to a low (approximately zero V). This low is then inverted by U2C and again by U3A causing RS flip flop U4A/U4B to "set" pin 3 (point X) high. Similarly, if a carrier is received which is just outside the low frequency limit of the window (750 Hz low), pin 6 of U1 would just reach the threshold of U2B (approximately -1.2 volts) and pin 8 of U2B would rise abruptly from a low to a high. This high would then be inverted by U3B and cause RS flip flop U4C/U4D to "set" pin 8 (point Y) high. In summary, therefore, point X will go high if a signal on the high side of the frequency window is received and point Y will go high if a signal on the low frequency side of the window is received. As soon as one of these points goes high, it will remain high (until cleared) and simultaneously the other point is inhibited from going high by means of the transposed connections to pins 10 and 12 of U3A and U3B, respectively. This inhibit action insures that only one indication is processed at a time. The method of clearing the flip flops will be covered later.

IC #	IC Type	+5V PIN	GAD PIN
U1	5556	#	#
U2	1489	14	7
U3	7400	14	7
U4	7400	14	7
U5	7400	14	7
U6	7493	5	10
U7	7442	16	8
U8	7430	14	7
U9	7430	14	7
U10	7400	14	7
U11	7402	14	7
U12	74121	14	7

* PIN 7 = +15V
PIN 4 = -15V

Table 1.



Prototype monitor and power supply.

U5 through U12 comprise the readout section of the monitor. Q1, a programmable unijunction, provides the clock signal. The frequency of oscillation of Q1 can be adjusted by selecting the value of R10. The 150K, shown for R10 in Fig. 1, corresponds to a code speed of approximately 20 wpm. Incidentally, if it is convenient to use a freerunning clock signal from existing I.D. circuitry, Q1 and its associated components may be omitted and the external clock signal connected to pins 1 and 2 of U5D. Assuming, for the moment, that pins 2 and 3 of U6 are low, U6, a four bit binary counter (7493), will be clocked by the oscillator (via U5D) and U6's binary output (pins 12, 9, 8 and 11) will address the inputs of U7, a one of ten decoder (7442). The outputs of U7 are connected to U8 and U9 in such a manner as to program (in Morse code) an H from U8 and an L from U9. The two outputs of U8 and U9 are gated through U10A and U10B, respectively. Point X, as previously discussed, when high, indicates a signal on the high side of the window. Point X connected to pin 2 of U10A, therefore, will permit the H to pass when it is high and Point Y, connected to pin 10 of U10B, will permit the L to pass when it is high. Whichever signal is permitted to pass is then routed through U10C, U11A and U11B. The purpose of U11B is to permit inhibiting any

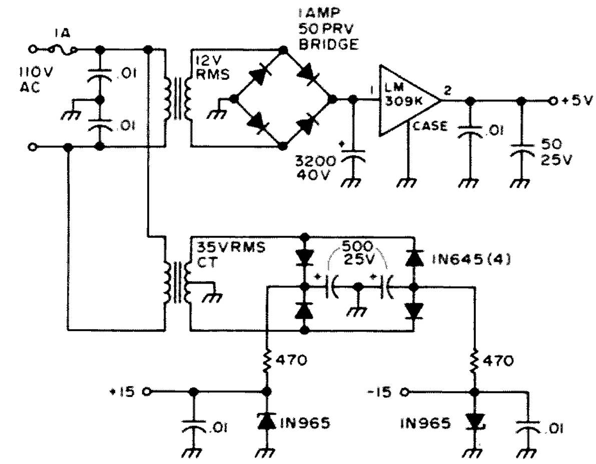


Fig. 2. Power supply, if needed.

Morse code output from the monitor while the repeater I.D. is being sent. To implement this inhibit action it is necessary to apply the "I.D. hold" signal (from existing I.D. circuitry) to pin 3 of U11B.

In the resting, or idle, state of the monitor, pins 2 and 3 of U6 are high and thus inhibit U6 from being clocked. Whenever a carrier is removed from the receiver input, however, the "carrier drop" signal causes pins 3 and 4 of U12 to go from a high to a low. This, in turn, causes U12, a one-shot multivibrator (74121), to produce a *negative-going* pulse at pin 1. The duration of this pulse is determined by R13 and C4, and for the values shown, is approximately 200 ms. Thus, 200 ms after the carrier drops, pin 1 of U12 *returns* to its high state and momentarily causes pins 12 and 13 of U10D to go high (via C5). Pin 11 of U10D, therefore, momentarily drops to a low causing RS flip flop U5B/U5C to set pin 11 of U5C (point I) high and pin 8 of U5B low. This results in pins 2 and 3 of U6 going low, allowing U6 to be clocked and thus initiates transmission of a frequency indication. Note that U6 will be so clocked each and every time a carrier is removed from the receiver input but a letter will be transmitted only if point X or point Y has been set high due to the carrier having been outside the frequency window. If neither X or Y is high, even though U6 goes through its counting sequence, the lows appearing at pins 2 and 10 of U10A and U10B will prevent any output from them. Similarly, when a carrier drop initiates an I.D., U6 will also be clocked, but even if X or Y is high at that time, pin 3 of U11B will be held high during the I.D. sequence and so inhibit any output from the monitor. Once clocking of U6 is initiated, it will continue counting until the count of 10 when pins 9 and 11 are both high. When this occurs, pins 4 and 5 of U5A also go high causing pin 6 of U5A to go low, resetting RS flip flop U5B/U5C. This resetting once again places a high on pins 2 and 3 of U6 resetting it and also inhibiting further clocking. U6 remains in this state until the next carrier drop which starts the whole sequence over again. The reason for the one-shot multivibrator is merely to provide a suitable time interval between the dropping of the carrier and the transmission of the frequency indicating letter.

Simultaneously with pins 2 and 3 of U6 going high at the end of the counting sequence, pins 1 and 2 of U3C momentarily go high (via C2). This causes pin 3 of U3C to momentarily go low and thus reset both RS flip flops U4A/B and U4C/D. This resetting ensures that both points X and Y are reset to low to prepare them for the next frequency indication.

Point I in Fig. 1 is provided for those repeaters which do not employ any transmitter drop-out delay and can be used with existing control circuitry to ensure that the transmitter is held on for the duration of the readout sequence (approximately 1 second).

The prototype unit was constructed on an experimental type PC board which accepts the mounting of a multitude of ICs, all of which must be interconnected by hand-wiring. The board and its power supply was then mounted on a 7 x 10 panel and this panel then mounted in a 7 x 10 chassis so as to completely enclose the unit and provide effective shielding. With the PC board now available, a smaller enclosure may be used but shielding should still be provided for the monitor, as it should be for any solid state unit to be operated in the vicinity of a vhf transmitter. A 9 pin socket was used for the interconnecting (shielded) cable used to interface the monitor with the I.D./control circuitry. The lead from the receiver discriminator was brought in separately via an ordinary RCA type phono plug. This lead was also shielded and because of the location

of the receiver at the WR2ACI repeater site, was about 25 feet long.

Initial adjustment of the frequency monitor should begin by setting the threshold levels of U2A and U2B. Temporarily remove the jumper connecting pin 6 of U1 to pins 1 and 10 of U2. Next, apply a variable voltage source of approximately 0 to 2V dc to pins 1 and 10 of U2. (Any handy potentiometer connected across a flashlight battery will suffice to provide this variable voltage.) With just the 5 V supply connected to the frequency monitor, slowly vary the voltage to pins 1 and 10 of U2 while monitoring pin 3. As you bring the voltage up from zero, pin 3 will abruptly drop to zero from about 4V when the voltage on pin 1 reaches approximately +1.2V. Make note of the exact voltage on *pin 1* when this drop at pin 3 occurs. We will call this the positive threshold of U2A. Reverse the voltage (battery) polarity on pin 1 and 10 of U2 and monitor pin 8 of U2B. As you increase the voltage on pins 1 and 10 of U2 (in a negative direction), the voltage on pin 8 will abruptly rise from zero to about 4 volts. The threshold adjustment for U2B consists of setting R7 so that this abrupt change from low to high occurs at the same voltage on pin 10 (but negative in polarity) as previously noted for the positive threshold of U2A. Once set, this adjustment need not be touched again.

Disconnect the variable voltage source from pins 1 and 10 of U2 and reconnect the jumper between pin 6 of U1sand pins 1 and 10 of U2. Set R6 to about mid-range and verify that there is a jumper between pin 2 of U1 and the end of R6 as shown in Fig. 1. Connect the ±15V supply to the frequency monitor, ground point H and monitor pin 6 of U1 with a voltmeter. Adjust R5 for zero (off-set) voltage indication of the voltmeter. This adjustment, like the previous one, is made once and then left alone. Remove the ground from point H, connect the 5V and the ±15V supplies to the monitor and attach the variable voltage source to point H. For this step the voltage applied to point H should be variable in the range of 0 to ±0.2V. While varying the voltage to point H, monitor the voltage at pin 6 of U1. Pin 6 should follow the polarity of the input voltage as you change it and also indicate an approximate gain of 10 (with R6 at mid-range). The final adjustment of R6 must be made with the monitor connected to the discriminator of the repeater receiver. The amount of gain required will depend on the characteristics of the particular receiver being used. If additional gain is required, the jumper provided between pin 2 of U1 and R6 can be replaced with a 100k resistor. The actual gain setting of R6 will be the one which produces the ± voltages at pin 6 of U1 which are exactly equal to the previously set threshold levels of U2 *when* calibrated frequency signals, set to the desired high and low frequency limits, are fed, in turn, to the receiver input.

The connections between U2 and U3 shown in Fig. 1 (i.e. A to C and B to D) are to be used if a positive output from the receiver discriminator indicates a signal on the high frequency side of center frequency. If, however, the discriminator produces a negative output for a high frequency signal, these connections will have to be transposed so that A connects to D and B connects to C. (The PC board available provides convenient pads to facilitate these changes).

The time constant formed by R1, C1 at the input to the op amp is employed to allow time for transmitter oscillators (particularly frequency synthesizers) to "settle" before being processed by the monitor. Note: C1 must be a paper capacitor (not electrolytic).

Fig. 2 shows a suitable power supply for the monitor. If convenient, the unit may be powered from an existing power supply at the repeater. The monitor requires approximately 150 mils for the 5 volt digital circuits and 2 to 3 mils for the ±15V supplied to the op amp.

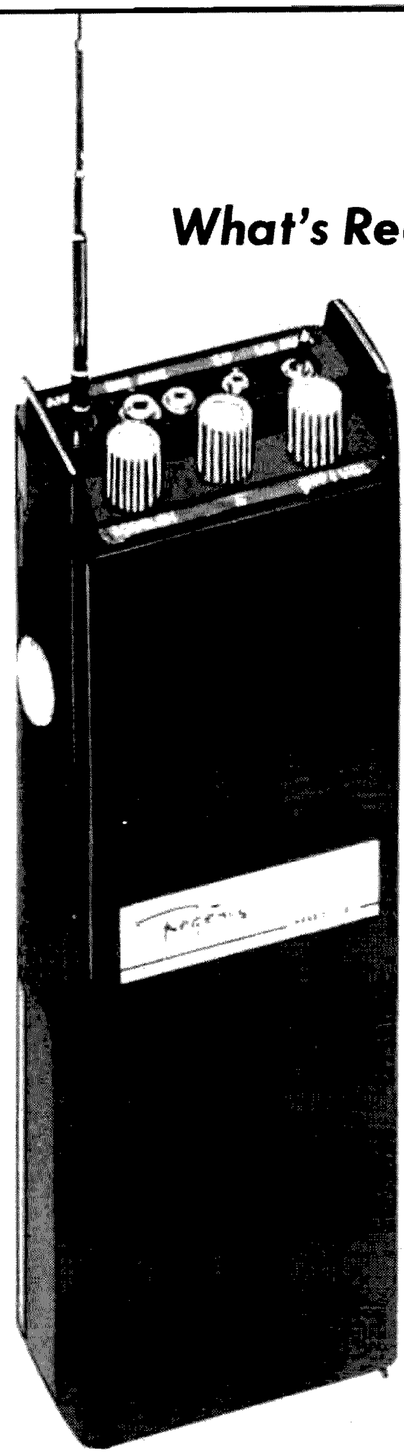
Point N is provided to permit inhibiting operation of the frequency monitor, when desired, by remote control via control circuitry. To inhibit the monitor, Point N should be grounded.

This frequency monitor has been in continuous service at WR2ACI since January, 1974 and I am sure that other repeaters will find it to be, as we have, a useful addition to their system.

...W2OC

Kent A. Mitchell W3WTO
1004 Mulberry Avenue
Hagerstown MD 21740

What's Really Inside The Regency HT?



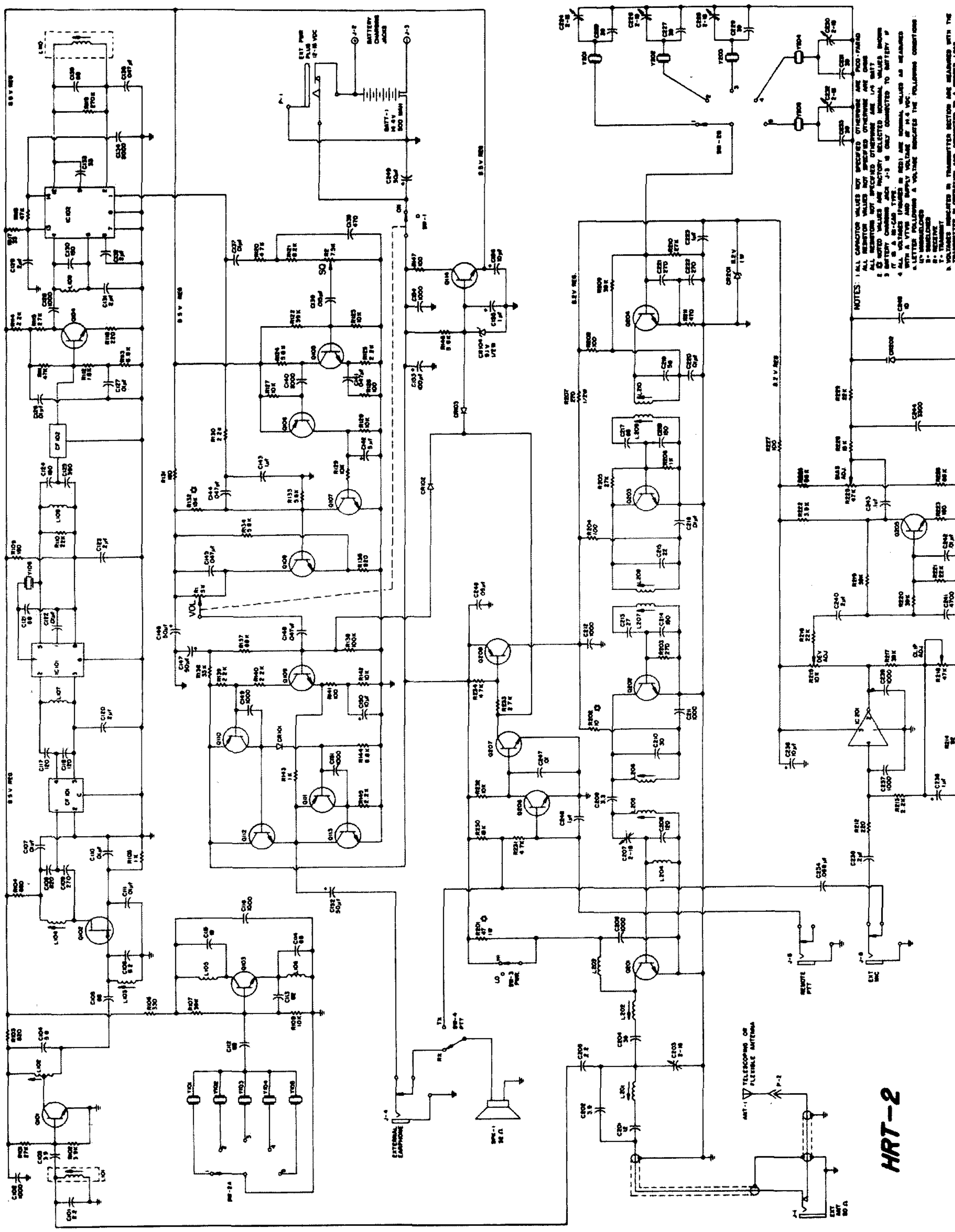
If you have been in the market for a hand-held transceiver for the 2-meter FM frequencies, you are by now aware that there are several such units on the market and that there is much diversity in both features and price. One unit, which is at the lower end of the price scale while still retaining a respectable position on the features chart, is the Regency Model HRT-2.

This transceiver is a five channel, all solid-state (3 IC's, 22 transistors, 6 diodes), compact package featuring a Hi-Low rf output of 1W/2.2W and a receiver sensitivity of 0.7 uV for 20dB quieting. Individual netting capacitors are provided for each of the 5 transmitting and 5 receiving crystals. All crystals are the plug-in type. Frequency modulation is generated via the standard biased varactor diode arrangement. An internal pot permits deviation adjustment from 0 to 7 kHz and is factory set at approximately 5 kHz. The receiver section is a double-conversion, super-hetrodyne design and uses two ceramic filters to assist in cross-channel interference rejection. Both transmitter and receiver are designed to operate uniformly across the entire 144-148 MHz band. Plug jacks are provided for using an external microphone with a remote PTT switch. (This is required when the rig is worn with a belt clip – a convenient mode of operation.) An external earphone jack is likewise provided.

The HRT 2 does not come battery equipped from the factory, leaving the operator with the choice of purchasing either the mercury type or the more expensive, rechargable, nickel-cadmium battery pack. The ni-cad need not be removed from the transceiver for recharging, as there are two recessed contacts located on the bottom of the unit for this purpose. NOTE: these contacts are automatically *not* connected when a mercury battery is installed. . .they tend to make loud noises when an attempt is made at recharging. The battery charger, a rubber duckey antenna, external microphone, earphone, etc., are available from Regency.

One other feature of the handie-talkie, not yet mentioned, is that its case is made of Acrylonitrile-Butadiene-Styrene. Say that three times real fast! In other words, high impact plastic, for when the time comes that you will drop the unit from your beer can type grip.

Priced at $179.00, Regency should sell a lot of these radios. . . .W3WTO



Behold, the complete schematic.

Would You Believe 187,000 Phone Patches?

Martin W. Krey K7NZA
7037 East Chaparral Road
Scottsdale AZ 85253

Some fine volunteer phone patch operations are going to bite the dust. The persistent winding down of American military involvement in Southeast Asia and the continuing homeward parade of servicemen are good indicators of the declining need for family communications between the U.S.A. and the Thailand area. It's a safe bet that with the need for their services gone, the groups providing the phone patch hookups stateside will disband, or change their equipment and operation so much as to be unrecognizable as the organization of Viet Nam conflict vintage.

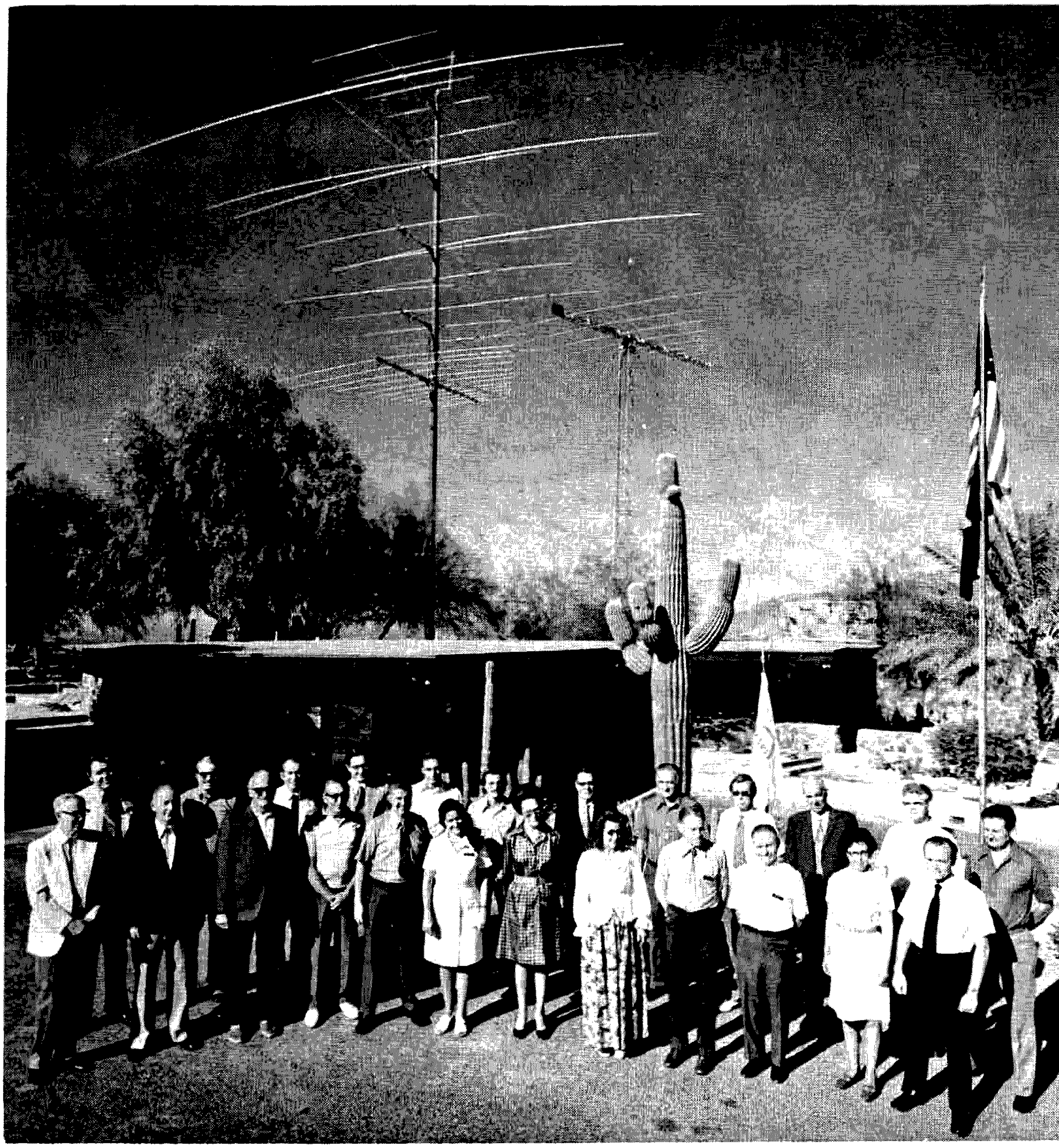
Before the big change is made, one ham decided to record as much as possible of the nature and spirit of one of the most successful patch outfits in the land, Bash-Hal-Ne-Ae. That's Navajo for "Metal that talks, sees and listens," and it's part of Ben-Nun-I-Kin; Navajo for "House on the Hill." Bash-Hal-Ne-Ae is a club station with 34 members, and it's owned by a guy described by an old friend as being "as common and down to earth as a dirt farmer." His main QTH is in Scottsdale, Arizona, and he's Barry Goldwater K7UGA.

Bash-Hal-Ne-Ae is known on the air as AFA7UGA, and according to Doris Counts, club secretary, the club began Air Force MARS service in August of 1967. Since that time, she says, the members have completed well over 187,000 phone patches for Airmen in the Viet Nam-Thailand-Philippines area. The club was organized solely to perform this service.

To visit Bash-Hal-Ne-Ae, you've got to get permission from the new head honcho, Tom Moore W7FCQ. (Bill Eccles K7MJC, well known manager for seven years recently retired due to illness.) The shack is just a few steps outside Senator Goldwater's back door, and while he is described as a very friendly guy, he doesn't want so many people up there that his grandchildren get trampled on their way to the swimming pool. Once you get inside Barry's shack, you will agree that it is one of the most far-out ham hangouts in existence.

First off, if Tom Moore or one of the other hams is inside chasing AIA8NA at Makhon Phanom, or one of the other seven Air Force MARS stations in Thailand all over the allotted frequencies, you won't make it inside the locked door. Nobody will hear you pounding. That means you're going to have to sit outside that beautiful stone shack in a stretchy relaxing chair and look out over a sparkling swimming pool, let your eyes take in the gorgeous homes and sprawling churches all around below you, and lay your eyeballs on serene desert mountain peaks such as Pinnacle Peak, Squaw Peak, and the famous Superstitions and other mountains that ring the Valley of the Sun. You can drink in great lungfuls of pure desert air and look up into a sky that is sparkling, bright and clear.

But you won't sit for long. Eagle-eyed Clarence Gartman will bear down upon you like he just caught you stealing the knob off the front door. You've blinked an electric



How can you ever get the whole membership of a club together? Here are 24 of the 38 Bash-Hal-Ne-Ae members. That's Barry Goldwater third from left in front and long-time station manager Bill Eccles first from the left. Husband and wife team of MARS members is Barbara Chamberlin WA7UHP, front center, and Bob WA7EIG. Group has completed over 187,000 phone patches for Airmen in Southeast Asia.

eye on the way in, and the grim caretaker has been sorting out your characteristics from inside the main house beyond the pool. He sees a strange car – no stars on the license plate – a droopy-shouldered guy with eyes glazed from hamming all night. You're gonna get bounced, unless you can prove that someone inside wants you in. Then out pops a key, and Clarence lets his face wrinkle into a grin, and his eyes twinkle. You're inside.

The first thing you see is the friendly face of Tom Moore, Dave Pollard WA7OVH, or one of the other club members behind the mike turning knobs or gently reminding an emotional wife in Brooklyn or Miami that

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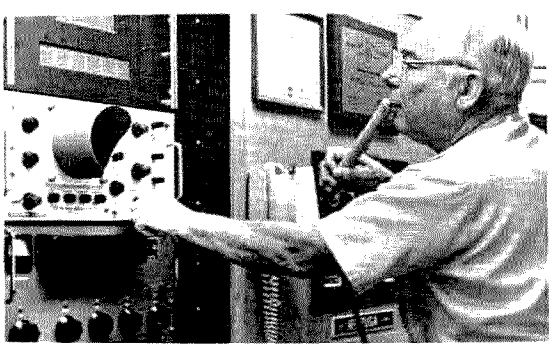

Tom Moore W7FCQ, station manager at Goldwater's Bash-Hal-Ne-Ae MARS station, wonders why they can't hear him in Thailand. Take heart, novices, for after checking the scope, this fine ham found he hadn't flipped the switch on the T-12 amplifier.

she's got to say "over" so that the radio hams can flip the switches to let her husband in Thailand or the Philippines talk.

Your eye quickly takes in the Robot slow scan television equipment and the double bank of Collins S-Line ham gear that is set in a gleaming wooden walk-in cabinet built by Elmer Olsen K7GPZ before he became a silent key two years ago. You note the S-1 and T-12 amplifiers, the Tektronix RM-15 scope, and the digital Heathkit frequency indicator. You see the airplane pedal foot controls for transmitters and receivers and the row of weather instruments indicating air temperature, pressure, wind direction, etc.

A picture of Kenny Hinderleiter K7HQF stands on a shelf above the weather instruments. He's the ham, blind since age fifteen months, who has run over a hundred thousand phone patches for servicemen, and whom the Air Force flew to Okinawa and feted in 1971.

Your eye becomes aware of a vast array of art treasures and trophies that cover the walls of the shack. Forty colorful Kachina dolls pop out from the stones of the fireplace, forty sacred and valuable manifestations of the Hopi gods, given to Barry by Indian friends. The dolls are the remnant of a 400-doll collection that Barry gave to the Heard Museum. Over the fireplace is a color enlargement of an Indian photograph, a study of a pensive Indian woman's face.

A long, built-in, cushioned bench fits under a row of picture windows on the north wall, looking out upon the length of Mummy Mountain. Above it is a collection of Air Force shoulder insignias.

Awards and plaques cover the walls even behind the ham gear cabinet. The north wall beside the picture windows is perhaps the most striking, for it bears a pencil sketch of a youthful Goldwater, surrounded by hundreds of signatures. It bears a dateline of 1960, Waldorf Astoria and the letters CSSC. Around the picture are autographed pictures of Presidents Kennedy, Johnson, Nixon, Eisenhower and Hoover. Jimmy Doolittle and Eddie Rickenbacker are there, as well as generals Spatz, MacArthur, Twining, LeMay, Mark Clark and many others. Even the Duke of Windsor has his picture there.

Right under this display is a low refrigerator for cold refreshments and a setup for making hot drinks. Visiting hams are invited to partake.

A ten-foot bookcase reaches nearly to the ceiling left of the door, and a quick glance tells you that the OM who owns them has a mind that likes to poke into many corners of knowledge. Among the hundreds of books are Buckley's *Eye of the Hurricane*, White's *Christ and Satan*, Lasky's *J.F.K.*, and Copley and Pourade's *Anza Conquers the Desert*.

To the right of the door another wall is covered by plaques and awards, all given to Goldwater. There is a YMCA Distinguished Service Award, and Inspiring Leadership Certificate from the Republican Conference, 88th Congress, two honorary doctor of laws degrees, and two Goldwater golden dollars, with his face on one side and the Liberty Bell on the other. The whole wall is covered.

But this is primarily a MARS station, so in the most obvious places, right over the ham gear, Senator Goldwater has placed the awards and certificates earned by the men and women who belong to the club and are responsible for its remarkable DX phone patch record. There's a certificate from Air Force Communications dated October 12, 1968, showing appreciation to AFA7UGA hams for running 10,000 phone patches for soldiers in Southeast Asia. Another dated July 15, 1970, is a Certificate of Achievement from the Department of Defense,

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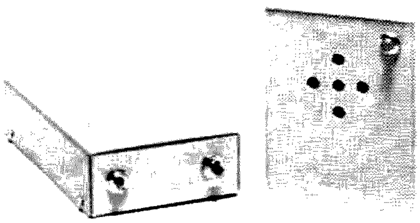

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Dealer Inquiry Invited

Voxpoop

While we are to some extent a prisoner of the authors of the articles – if they don't write them we can't print them – still we do like to know your reaction to what we do publish so we can keep trying to bring you what you enjoy the most. In the interests of science then, please let us know which articles you enjoyed the most and which you disliked most. The author of the article with the most votes will get a check for $50 extra to encourage him to get busy and write more.

WOW!

UGH!!

VOXPOOP, 73, Peterborough NH 03458

Military Assistance Command, signed by General Creighton Abrams. Still another, from the Department of the Air Force, is for completing 100,000 phone patches between December 1965 and December 1971, signed by General John D. Ryan, Chief of Staff.

On the end of the rig cabinet, facing the door, are individual engraved name plates for the four club members who have become silent keys since the beginning of the phone patch service.

Between the rig and the long bench stands a glass-topped trophy table containing an array of pins, medalions, gavels, keys to cities, and other trophies given to K7UGA by people all over the nation. But placed prominently on top of the glass is a large, thick book of letters from soldiers, YL's, XYL's, and parents who wanted to say thanks for phone patches.

A wife in Tucson wrote in 1970, "No greater Christmas gift could I and my two children have than a call from my husband." A Houston father wrote in 1971, "My wife – in between tears – was thrilled to hear the voice of our son." An undated letter from a sergeant in the combat zone said simply, "A call to loved ones is the next best thing to being with them."

A letter from a Phoenix hospital thanks the hams for speedy contact with a doctor in Viet Nam when the postal service couldn't get the job done in two months. The writer voices surprise that the station could put the hospital person-to-person with their man so quickly "over a distance of 13,000 miles."

The most striking thing about the phone patch service is the apparent ease at which the whole thing is carried off. Tom Moore or another op points the Collins 237B log periodic beam toward Thailand, tunes the 32S-3 to a MARS frequency, zero beats the 75S-3C, and calls one of the stations he's recently had good, solid hook-ups with. If conditions are good, he gets a booming answer, signal reports are exchanged, the stateside ham gets a Ma Bell long distance operator on the line, and the waiting Airmen at some base in or near Thailand get to talk home.

The character of the conversations has changed since the life-or-death element has been lifted from Southeast Asian duty.

There are still tears and emotion, but much of the anxiety and assurances of safety have been replaced by information on duty changes, instructions to wives, requests for information on the kids, wifely requests for blue star saphire rings, etc.

Right now AFA7UGA is experiencing propagation problems because of the bottoming section of the eleven-year sunspot cycle, and Tom Moore has only two shifts of operators working. One starts at 4:30 a.m. and runs to 7:30 a.m.; then the other takes over and goes until the bottom falls out. Twenty-five to fifty completed patches a day is typical.

Typical, too, is the broken contact anywhere from 9:00 a.m. to noon, when the D-layers open up. "Four and a half KW's," says Tom then, "and all of it right out through the old chicken wire."

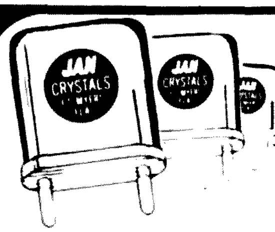
That's when he pulls the big switch and tells the sweet-voiced land-line operator, "We've been shot right out of the saddle. Better knock a couple of minutes of waiting time off that last call, and we'll buzz you tomorrow."

Then he secures the gear and the shack, ushers the nosey visitor out, and goes home to grab a bite before dashing off to work. Before he drives off, he hangs out of his car window and says, "You just can't imagine the dedication of our club members. Why, Bob Kraig W7OYC hasn't missed a Sunday in eight years. He works every Sunday from 4:30 a.m. until noon. That's the kind of participation that has made our station successful."

By the time the sunspot cycle has made MARS DX as good as an eyeball QSO again, there may be virtually no need for its Southeast Asian phone-patch services. But in case some other need arises, it's a good bet that Barry Goldwater and other shack owners will keep big books of thank you letters handy to remind them that they should keep the old bucket of bolts in good working order.

And the hams? You know they'll be ready.

...K7NZA



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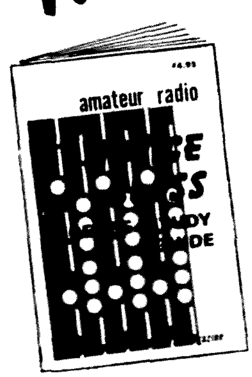

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73 Magazine — Peterborough NH — 03458

GRR GRRREEN

SPELL MY NAME RIGHT

There is an old addage that any publicity is good publicity – say anything you want to about me, but spell my name right. In this vein I would like to express restrained appreciation for the PR job being done in my behalf by ARRL officials. It *is* nice to be recognized.

I am sure that some of the people who have devoted a good deal of the last ten years hating my guts for opposing the "incentive licensing" restructuring of amateur radio will be as astounded as I to hear that it was I who was responsible for this debacle which the FCC is now getting ready to try and rectify. My opposition to that ARRL petition for rule making (1963) was on the philosophical grounds that it is psychologically better to get desired results with a carrot than with a stick – the result in this case being to encourage amateurs to go for higher classes of license. Taking away bands to force amateurs to increase their grade of license would, I felt, create resentment and frustration.

The League worked hard and long to get their proposals accepted and they succeeded. Yet today I have a tape of my good buddy Lew McCoy telling a club that I was responsible for incentive licensing. While on the one hand I suppose that I should be flattered that the single most important change in the amateur rules, in recent years, was due to me, it is difficult to pretend anything but resentment over the whole concept of using punishment instead of rewards to achieve ends. . .which is what incentive licensing comes down to.

Surely I must be either lying or exaggerating – right? In case you might find a copy of this tape of interest – Lew talks about the current FCC plan to restructure amateur radio – tells how badly the recent FCC hearing went – and has some interesting things to say about Prose Walker – this is all available on a 90 minute tape for S5 from 73, Peterborough NH 03458. Ask for the Real McCoy.

RADAR ZAPPER?

A chap stopped by the 73 offices the other day – reads 73 – goes by the name of Bad Back on channel 10 he said. He was awfully concerned about the new two-way radar which allows police in unmarked cars to get copy on Bad Back's speed even when they're going in opposite direction. There must be something that can be done about an invasion of privacy like that!

Another channel 10 denizen who goes by the name of Radio Doctor (he fixes FM sets) stopped by and explained that what Bad Back needs is a simple 10.5GHz oscillator modulated at 3400Hz. This would add 100 mph to the radar reading, which would either result in one whale of a speeding ticket or a very confused cop.

While we certainly don't want to help people break the law, even by speeding, the idea that it would be nice to have a little old 10.5GHz oscillator circuit around for testing out those radar units stuck in mind. I'm sure that there are a whole lot of readers who at one time or another would like to be able to help a state trooper test out one of those damned radar units. So, how about it. . .any Edison types out there who can coax enough 10.5GHz rf out of something we can all afford to cut the mustard? You know, a thing like that might sell like crazy at truck stops if some entrepreneur got busy making them.

MAKING YOUR HOBBY PAY

I've been looking back over the last year or so of 73 and, while we've had some exciting articles, I just don't feel that overall we've had as much really good stuff as we used to. We need a lot more articles and we are going to pack the magazine with them.

If you've built something that your friends are enthusiastic about, whether it be a receiver, QRP rig, FM rig, repeater, sideband rig, amplifier, keyer, test equipment, an antenna, logic or digital circuits, preamplifier; if it's your own design then you should write it up (double space typed), sketch the circuit, and have a couple of pictures taken (or send in the unit so I can take the pictures).

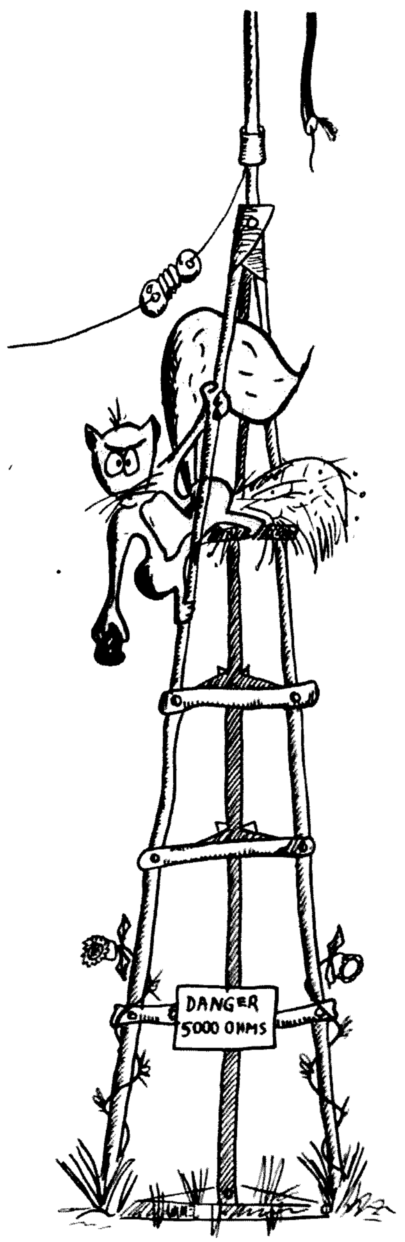
There are several benefits. First of all it is nice to be a published author. Your friends will be impressed at the club -- and when you get on the air you'll be surprised at how many fellows know you. It doesn't hurt with your own family and non-ham friends either. The cash we pay for articles may not put you into a higher income bracket, but it will help buy a new rig or some parts. We do pay well compared to some of the other ham magazines. . .very well. Several of our writers have made thousands of dollars.

It doesn't hurt when you're applying for a job to have a list of your published articles on your resume.

While I am more interested in construction projects, large and small, than anything else, we still need a lot of articles on every aspect of our hobby: DXing, traffic handling, MARS, Races, certificate hunting, contests, moonbouncing, satellite work, CW, VHF DXing, VHF sideband, antennas of all sorts, 160m, Novice problems and solutions, service net info, intelligent discussion of FCC dockets and proposals, and even humor.

One warning – it might be prudent not to say too much around home about how much we pay for articles. One author let his wife know how much he was getting and from then on she made him write ten pages every night before she would let him go to bed with her. He was one of our most prolific writers.

. . . WAYNE



Voxpoop

Readers have been asking for articles and commenting on 73 – here are some of these recent comments: Let's see some RTTY info. How about a surplus column? You devote far too much space to 2m stuff! – WA6SOJ. *(That's a good idea about the surplus column, anyone interested in working on that? Send in an outline of what you would cover and a sample column. . .wayne)* Like the article on the 10 minute timer – WA1PAL. Need more product reviews. Encourage owners of new equipment to comment. Restrict the articles to top flight equipment only. Who cares if poor items are poor? – W9BNQ. *(Excellent! Readers should remember that 73 pays for articles, so if you get something new and have an interesting report on it, pass it along. . .wayne)* It was nice to see the 390/392 surplus article, but these are out of my price range so I would like to see articles on cheaper surplus – especially 160m and FM gear – WA6SLN. *(Right, how about it readers?. . .wayne)* Newspages are great and the IRS notes interesting to say the least. Would like to see more specialized columns such as RTTY, fast scan TV, and VHF work. The brevity of the DX and contest columns are appreciated, but also contain info enough for those who are interested in these fields. Keep up the good work – W5SSN. Keep up the IRS info – WB6AYJ. How about an article on a homebrew 2m FM repeater? Solid state or using the VHF Engineering modules? – WA3WID. *(In the works, watch for it. . .wayne)* Possibly more antenna articles, including 2m FM – WA7WOC. Enjoyed all your articles, particularly K1CLL! Maybe you could keep both solid state columns? – WB2PAP. Circuits is great and liked Scott's solid state column. Less repeaters and don't forget the CW guys, particularly QRP. More on ICs and simple transistor circuits – K6AE. *(Bill has said it, so let's see more QRP, more CW articles, more ICs, and build up those simple gadgets for us. . .wayne)* I'm tired of reading about your troubles with the IRS – WA7SFL. The magazine needs more theory articles such as in a continuing series – WN7VUC. *(Any volunteers to write same?. . .wayne)* Don't forget the Novice projects, we need them! – WN2TQM. *(Let's have a whole lot of info for Novices – simple projects to build – rigs – QRP – operating ideas, the lot. . .wayne)* Would like to see more of K1CLL; more VHF and UHF construction articles – K5HTE. *(We have a lot more in the works Doyle, and plead with readers who are playing with this stuff to write as CLL is retiring!. . .wayne)* I like the editorials and newspages the best. It's impossible to print too much on 2 meter FM. Like articles on antenna design and construction – WBØFZL General discussion of propagation conditions and the sunspot cycle and when it will get better – WN3VZN. *(Alas, better is still a long way off. It's best to cope with it as it is and enjoy – there's lots of good stuff to work. . .wayne)* Please put in more UHF construction articles – WNØMBY. Boy, do you troops fill a gap in the ham hobby! Just keep up the good work – more easy to build construction projects – how about the care and feeding of LEDs? Any tube projects in mind? Just curious – K7ATU. *(Yep, we have some coming along for us old timers and Novices too. . .wayne)* The Circuits column is great. How about an antenna column?. . .that's all that is keeping me subscribing to CQ – WBØICG. *(Lordy! I never realized how badly 73 needed an antenna column before. Any volunteers with an outline and sample column?. . . wayne)* You got a good ham radio magazine, thanks – WN8RDN. *(Thanks Mike. . .wayne)* VHF 2m FM construction, starting simple and working up to the complex – W7DOU. Both solid state columns were good – WBØNAG. I liked Scott's solid state column best – WA2ADZ. We need more news about what the DOC/FCC is doing about clamping down on CB and what we hams can do about these bootleggers – VE2BAQ. *(The Canadian proposal to legalize hobby and skip CB operation could be the answer – and it could mark the end of amateur radio too. . . wayne)* I think 73 is well balanced so keep up the good and interesting work – WA8SHT.

RECIPROCAL LICENSES IN THE UNITED KINGDOM

Overseas members are reminded that there are several different types of license available to them allowing them to operate amateur radio stations in the U.K. provided a reciprocal licensing agreement exists between their country and the U.K.

The simplest form is an authorization for a visiting amateur to operate the station of a licensed U.K. amateur. In this case no call sign is issued. For example, should F8TH operate from G3BID under this arrangement he would use G3BID's call and sign the log as operator just as another G operating from G3BID would have to do. Such permission is granted for seven days maximum.

The other category is when a G5-plus-three call is granted and it is here where some confusion seems to have arisen. There are two types of such license. Amateur (Sound) license C and Amateur (Sound Mobile) License C are valid for one year and are only issued to persons coming here for more than three months (NB this may be six months now). It is intended for those coming to work or live and such applicants must produce an Alien's Registration Certificate before a C License will be granted.

The second of this type of license is probably the more frequently issued and is the D License which is now valid for six months. This is the one to apply for when you are coming here on a vacation and, like the C version, is available for fixed or mobile operation.

An important point to remember is that you may apply just for the mobile license if you are not going to operate a fixed station. By contrast U.K. amateurs cannot be granted a mobile license unless they also hold a fixed station license.

Full information on reciprocal licensing can be obtained from the Society's Information Service. The address is: BCM/ARMS, London WC1V 6XX

Please do NOT send queries on reciprocal licensing to any other address as it will only delay matters. When you get the information, please read it carefully and make sure you apply for the proper type of license.

Mobile News

THE LONG WAVE CLUB OF AMERICA

Michael Kane's (WA1PJG) letter about ULF listening prompted me to write. There is indeed a club devoted to dxing the frequencies below 550kHz known as The Long Wave Club of America which started this January. (Present membership is about 75.)

We publish an 8-page mimeo bulletin called the Lowdown, which lists member's loggings and carries technical articles from time to time. Sample copies are available for SASE. Of particular interest is the license free band (160-190kHz) which we are trying to organize – I am looking for an editor to write a column on activities in this area. Dues are free and to join just send a letter that you wish to receive the Lowdown. I am, however, asking all joiners to send me a year's supply of self-addressed *legal size* envelopes to cut down on publishing time. Also a log of 2500 beacons in the western hemisphere is available in limited quantities (like about 80) from the club for $2.00 postpaid. Write: John Clements, President, Long Wave Club of America, 11425 Albers Street #5, North Hollywood CA 91601.

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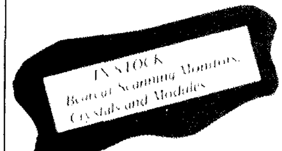

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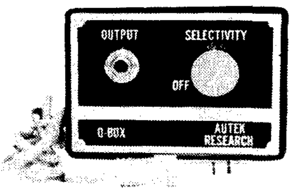

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(73 Magazine test report)

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DUAL MODE Hal DKB-2010 keyboard with 128 key buffer. Factory assembled, brand new – won at Dayton 1974. $510. Richard Mawhorter, 10584 Latina Ct., Cincinnati OH 45218.

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Tom Norman
Laurinburg NC

suming. Use a tool for inserting and removing ICs. Stranded wire with fused tining is convenient to strip and handle but cannot be flexed much without breaking.

If the instrument consists of several functions, construct and test each ...

Solid State from page 17.

high on the appropriate digit select pin. Both BCD and digit select outputs have three state controls providing an "open circuit" when these controls are high and allowing time multiplexing. Several MC 14534CL's can be cascaded to provide higher count sequences. This counter can be used in many real time counting applications such as event, frequency and control counters. When used with faster logic families, it could become a significant part of a VHF frequency counter.

Both of these CMOS ICs are intended for 5 to 15 VDC operation. Power consumption is from 2 to 37 milliwatts. Both are available from your Motorola distributor at $25.26 for the MC 14534CL and $8.34 for the MC 14536CP in single quantities.

An observant reader, Max Hauser of W6-land, reminded me that in my July column (written in Jan.), I overlooked two quad op-amps that are now available. These are the National LM324 and Raytheon RC4136 which are claimed to meet or exceed all specifications for the single 741 op-amp. You can obtain these ICs from several 73 advertisers for approximately $2.00.

Finally, why don't you send that QSL listing your ideas right now while you're thinking of it. 73 for now!

MORE IRS MAIL

I've been reading with initial shock and increasing horror about the tyrannical tactics of the IRS, both in 73 Magazine and in the newspapers (I remember seeing that story break last summer concerning the several IRS agents all coming up with different ways of figuring identical tax returns – it seemed funny then, but it isn't funny anymore). I was intrigued by your reporting the element of the "tax revolt" that crosses out the perjury statements on its several returns, and decided to try it. Much to my surprise, it works!! I mailed my form 1040A (short form) on 25 January and received my refund March 4. I also crossed out the perjury statement on my sister's return, which I prepared; her refund came in the mail with mine. Our refunds totaled over $500.00. So, chalk one (or two) up to the "tax revolt." I hope we can, through modification (read "sweeping revision") of the federal tax laws, eliminate its necessity for existence, but until then, it *is* necessary for it to exist.

To change the subject (but not a lot), thank you for being controversial in 73. I am a life member of ARRL and a lifetime subscriber to 73, and I find both QST and 73 necessary to have. I think they complement each other quite well – the conservatism of QST and the liberal (if not sometimes radical) stands taken by 73. Your editorial policy re technical articles has been vindicated many times over, and I prefer your policy of finishing one article before starting another (thus eliminating the "see page x" nonsense found in almost any other given magazine of over 8 pages).

You got me interested in Mensa through editorial mention of it some 3 or 4 years ago. I've since joined and enjoy being an M quite a bit (whenever my ego is feeling bruised I get out my membership card and look at it for a while). Haven't seen anything about it lately in 73, though.

Enjoyed the article about calculators in December issue. Got a Texas Instruments SR-11 and that is one real nice piece of stuff for only a hundred and ten dollars – it's kinda like a "poor man's HP-35!"

Please don't publish my real name if you decide to print this letter in the magazine. I've got enough problems trying to graduate from college and work fulltime without having the IRS on my ass, as I'm sure they would be if my name and call were published.

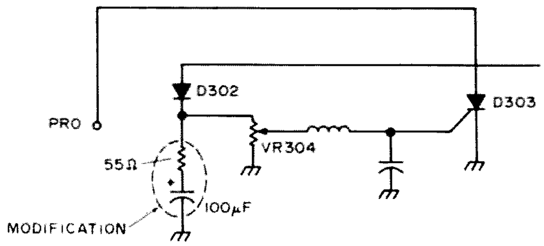
Keep on keepin' on, Wayne!

Name Withheld

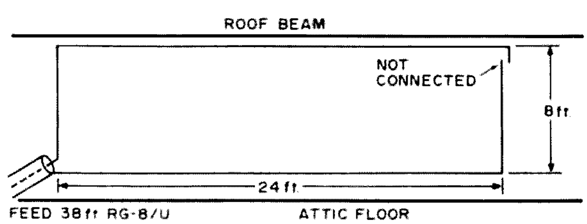
CIRCUITS, CIRCUITS, CIRCUITS...

The following circuits have appeared in the reference books, magazines, application notes, etc. While we try to reproduce all of the information that should be needed by an experienced constructor, readers may want to avail themselves of the original sources for peace of mind.

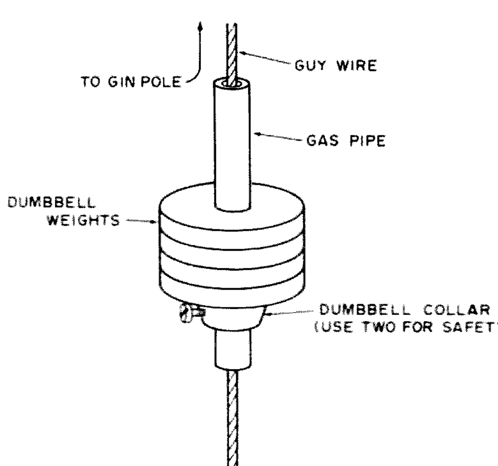
Readers are requested to pass along any interesting circuits that they discover in sources other than U.S. ham magazines. Circuits should be oriented toward amateur radio and experimentation rather than industrial or computer technology. Submit circuit with all parts values on it, a very brief explanation of the circuit and any additional parts information required, give the source and a note of permission to reprint from the copyright holder, if any, and the reward for a published circuit will be a choice of a 73 book. Send your circuits to 73 Circuits Page, 73 Magazine, Peterborough NH 03458.



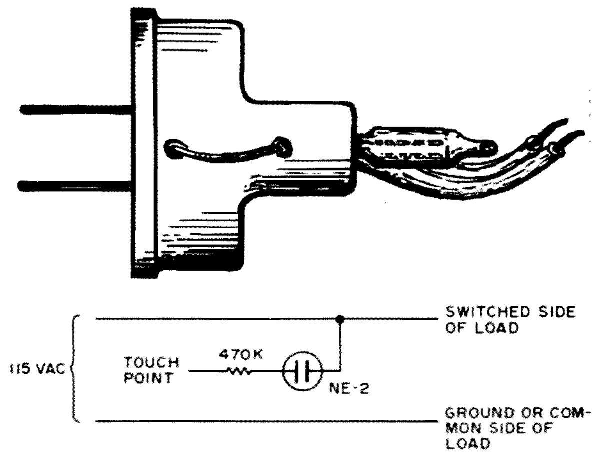
SB-144 mod to key an amplifier – added 55 ohm resistor and capacitor delay the SWR protection circuit for a fraction of a second permitting relay in amplifier to switch over. Thanks WB9IMM.



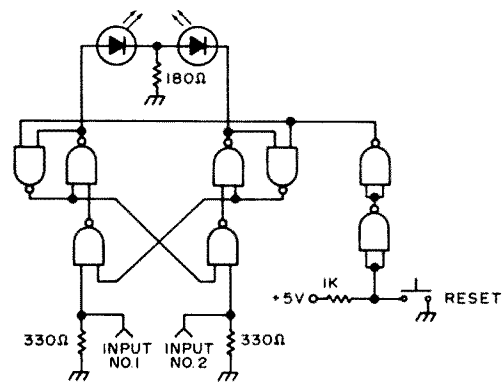
W8KOI attic antenna for 40 and 15m. Uses RG8/U and no balun. Use #18 wire and staple gun for installation. No bad antenna whery an outdoor antenna is a problem.



WA0KKC aid for pulling tower sections up a gin pole uses hollow gas pipe and dumb bell weights for counterbalance. Clever!



Hot line side finder – uses body capacity to light neon bulb – glows only when bulb connected to hot side of line – resistor value not critical. Thanks B. Sutphin of St. Petersburg FL. Could save your life.



Which input is first? This circuit will tell. Makes a good game – with two people trying to push a button first, etc. Two 7400's may be used. Thanks WA7SBH, who gets a free book of his choice for submitting this circuit.

CORRECTION

73, June 74, p. 77

FSK Demodulator from July 19, 73 Electronics: You left out the Bridged Tee feedback loops on both 741's. I sent you the clipping from my copy, but I am sure they were on the original. Hi-Z in, so audio feed is no problem except for too much input and distortion.

Fritz K4ETZ

LETTERS *from page 15.*

FCC BRAVOS

Just like to send a note about an experience dealing with the FCC. I was employed this summer as one of two counselors in a summer camp instructing in ham radio. As part of the instruction, those interested in obtaining their licenses were drilled on code and theory and then administered their Novice tests while at camp. We had one camper pass his code test about halfway through the season and within two weeks had received his written. Somehow during the period he had completely lost interest and declined to take the written. Meanwhile another young camper had passed his code test and since time was running out, we feared the written portion of the test would not arrive in time. Being only 20 or so miles from Gettysburg, I made the trip there one afternoon. After passing the building 4 times, unknowingly, I got directions and entered the small recessed office. Upon entering I was ushered to the main office area from the lobby and proceeded to explain my problem to the woman at the nearest desk. She escorted me to another clerk to whom she explained the problem, and they both put aside what they were working on and began to pull out other files. In a matter of minutes the necessary paperwork had been completed and a Novice test package completed, addressed and sealed. When they handed me the test, it was with a smile and a wish of good luck for the applicant.

I was amazed that with all the work they have, they could make time to handle a problem like mine and be very friendly about it. Take my word for it when I say they have some wonderful people down there.

Chuck Davidson WA3LXB

PHONE PHREAKS VS MA BELL PART II

If you're like me, the original article on the "Phone Phreaks VS Ma Bell" left me on edge like an Alfred Hitchcock movie. Being an inquisitive individual, I began my search at the local library for the October 1971 issue of Esquire magazine. Mr. Rosenbaum's article was also a Hitchcock special, as he rather conveniently neglected to mention what the "super-secret" tone frequencies were. Needless to say, this was the driving force I needed to really launch an all-out search for those tones, AND HOW Ma Bell uses them. . .NOT to defraud the phone company, just to be able to say, "I know!"

After several months of searching the archives of various collections of electronics publications I found what I was looking for AND MORE!

All right, Mr. Rosenbaum's article was correct in that the whole show starts with 2600 Hz. Now, ever wonder why the common Touchtone (TM) pad came equipped with such an array of wierd tones? I'm referring to those oddball frequencies of 697 Hz, 770 Hz, 1209 Hz, etc. Who was the nut who decided on these particular tones and why? The answer is simple. Touchtone (TM) frequencies were selected so they can in no way interfere with the trunk signaling tones. It soon becomes obvious that the trunk signaling tones were picked first, otherwise we would probably have nice even frequencies in our TT pads.

2-out-of-6 code	Assigned freq (Hz)		# Desired in dialing	Components of desired #
0	700		1 (0 plus 1)	700 + 900
1	900		2 (0 plus 2)	700 + 1100
2	1100		3 (1 plus 2)	900 + 1100
4	1300		4 (0 plus 4)	700 + 1300
7	1500		5 (1 plus 4)	900 + 1300
*	1700		6 (2 plus 4)	1100 + 1300
			7 (0 plus 7)	700 + 1500
			8 (1 plus 7)	900 + 1500
			9 (2 plus 7)	1100 + 1500
			0 (4 plus 7)	1300 + 1500
		Key Pulse	(4 plus *)	1300 + 1700
		Start	(7 plus *)	1500 + 1700

Yes, I hear the shouting, "what are the tones. . .what are the tones?" The trunk signaling tones ARE: 700, 900, 1100, 1300, 1500 and 1700 Hz. Ma Bell assigns these tones numbers, and pairs them together in a two-out-of-six code. The PAIRS are then and only then valid signaling information (see chart).

As shown in the chart, the tones are paired together so that the two-out-of-6 sequence adds up to the number desired in actual dialing. The Key pulse and Start digits are equipment information bits that tell the trunk decoding equipment that a series of tones are coming up or have ended. International country codes ALSO use these same tones, for uniformity.

How The Phone Phreaks Do It

They begin by dialing (on a regular phone) an 800 area code (INWATS) number KNOWN to be registered in a state besides their own. When the distant end begins ringing, then immediately beep out a short burst of 2600 Hz (disconnect tone). The distant end then stops ringing. Next they send out the "key pulse" pair followed by the area code and the number (using tones in above chart). This is followed immediately by the "start" pair. When the distant end rings this time, it is the number they desire, toll free!

They Get Caught

Ma Bell is always dreaming up super-sophisticated ways of foiling phone phreaks. A couple methods involve the use of 2600 Hz filters on the subscriber side of the line. One method filters out all 2600 Hz coming from the customer end, so the would-be phone phreak never gets off the ground. Another method brings up a central office alarm and seizes the incoming line. Even if the phreak hangs up, his line will remain seized until the phone company can trace him down and ask him what he is using 2600 Hz for!

A loud and clear word of caution: Do not attempt to build, buy, beg, borrow or steal a tone generating device capable of reproducing the tones given in the chart, with the idea in mind of using it to place calls. Such use CONSTITUTES FRAUD AGAINST THE TELEPHONE COMPANY. This article is for educational information only.

. . .WB9FOP

References

ESQUIRE, October 1971, P. 116 "Secrets of the Little Blue Box" by Don Rosenbaum.

73, January 1972, p. 31, "Phone Phreaks VS Ma Bell" by Martin Bradeley Weinstein.

A LITTLE DISSENT

Wayne Green may have a point. If the big magazines, newspapers, etc., are terrified of the IRS its up to the unterrified little guys to speak up. And it may be that a little dissent won't hurt amateur radio.

Anyway, here is a three year renewal to 73 to go along with my subscriptions to QST, Ham Radio and CQ. I think they all have something worthwhile.

M.C. Bowers, Jr. K4VQ

OUR REPEATER IS LICENSED

Enclosed is a check to help defray the cost of your HOTLINE paper which our club would like to subscribe to.

I would also like to take this opportunity to thank you for the information which your magazine covered about 18 months ago about how to license a repeater. I followed this guideline fairly close and was privileged to have the first repeater in the state to be licensed under a WR call. I received the call in about 3 months. A second application filed almost exactly like the first took 53 weeks. This one had to take an all out effort by the FCC to take so long, A couple of letters and a phone call finally woke them up.

Most of the members here take 73. All of us appreciate the efforts that you have made for us and other amateurs.

William C. Cousin

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PROPAGATION CHART
J.H. Nelson
Good (open) Fair (☐) Poor (O)

November – 1974

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	$\boxed{5}$	6	7	$\boxed{8}$	$\boxed{9}$
$\boxed{10}$	$\boxed{11}$	$\boxed{12}$	$\boxed{13}$	14	15	16
$\boxed{17}$	$\boxed{18}$	19	20	21	22	$\boxed{23}$
$\boxed{24}$	$\boxed{25}$	26	27	28	$\boxed{29}$	$\boxed{30}$

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7A	7	7	3	3	3	3	3A	7	14	14	14
ARGENTINA	7	7	7	7	7	7	14	21	21	21	21	14A
AUSTRALIA	14	7B	7B	7B	7B	7B	7B	14	14	14	14	14A
CANAL ZONE	7	7	7	7	7	7	14	21	21	21	21	14
ENGLAND	7	7	7	3	7	7B	14	14A	14A	14	7B	7
HAWAII	14	7B	7	7	7	7	7	7B	7A	21	21	21
INDIA	7	7	7B	7B	7B	7B	14	14	7B	7B	7	7
JAPAN	7A	7B	7B	7B	7	7	3	7	7B	7B	7B	14
MEXICO	7A	7	7	7	7	7	7	14	21	14A	14A	14
PHILIPPINES	7A	7B	7B	7B	7B	7B	7	7	7	7B	7B	7A
PUERTO RICO	7	7	7	7	7	3A	14	14	14A	14A	14	14
SOUTH AFRICA	7	7	7	7	7B	7A	14	21	21A	21	14	14
U. S. S. R.	7	7	3	3	7	7B	14	14	14	7B	7B	7
WEST COAST	14	7	7	7	7	7	7	14	14	21	21	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7A	7	3	3	3	3	3A	7	14	14A	14
ARGENTINA	14	7	7	7	7	7	7A	21	21	21	21	21
AUSTRALIA	14A	14	7B	7B	7B	7B	7	7	14	14	14	21
CANAL ZONE	14	7	7	7	7	7	7A	21	21	21	21	21
ENGLAND	7	7	7	3	7	7	7B	14	14	14	7B	7B
HAWAII	14A	14	7	7	7	7	7	7	7A	21	21	21
INDIA	7	7	7B	3B	7B	7B	3B	7A	7A	7B	7B	7B
JAPAN	14	7B	7B	7	7	7	3	7	7	7B	7B	14
MEXICO	7	7	7	7	7	3	3	7A	14	14	14	14
PHILIPPINES	14	7B	7B	3B	3B	7B	3A	7	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7A	14A	21	21	14A	14
SOUTH AFRICA	14	7	7	7	7B	7B	14	21	21A	21	14	14
U. S. S. R.	7	7	3	3	7	7	7B	14	7A	7B	7B	7

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7A	7	3	3	3	3	3	7	14	14	14
ARGENTINA	14	14	7B	7	7	7	7B	14	21	21	21	21
AUSTRALIA	14A	14A	14	7B	7B	7B	7	7	14	14	14	21
CANAL ZONE	14	7	7	7	7	7	7	14	21	21	21	21
ENGLAND	7B	7	7	3	7	7	7B	7B	14	14	7B	7B
HAWAII	21	14	7A	7	7	7	7	7	7A	21	21	21
INDIA	7	14	7B	3B	3B	7B	3B	7	7	7	7	7B
JAPAN	14A	14	7B	7B	7	7	7	3	7	7	7B	14
MEXICO	14	7A	7	7	7	7	7	7A	21	14A	14A	14
PHILIPPINES	14A	14	7B	7B	7B	7B	7B	3A	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7	14	21	21	21	14
SOUTH AFRICA	14	7	7	7	7B	7B	7B	7A	21	21	14	14
U. S. S. R.	7	7	7	3	3	3A	3	7A	7A	7B	7B	7B
EAST COAST	14	7	7	7	7	7	7	14	14	21	21	14A

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

Amateur Radio

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DECEMBER 1974

73 MAGAZINE

73 Amateur Radio

#171 DECEMBER 1974

CONTENTS

FEATURES

73 Magazine is published monthly by 73, Inc., Peterborough, New Hampshire 03458. Subscription rates are $7 for one year in North America and U.S. Zip Code areas overseas, $8 per year elsewhere. Two years $12 and $13 overseas. Three years, $15, and $16 overseas. Second class postage paid at Peterborough, New Hampshire 03458 and at additional mailing offices. Phone: 603-924-3873. Microfilm edition of 73 available from University Microfilms, Ann Arbor MI 48106. Magnetic tapes available from Science for the Blind, 332 Rock Hill Rd., Bala Cynwyd PA 19904. *Entire contents copyright 1974 by 73 Inc., Peterborough, NH 03458.*

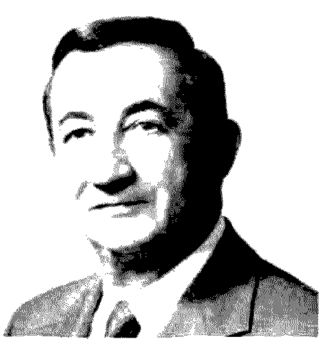
Amateur Radio

DECEMBER MCMLXXIV Monthly Ham

FCC Chief Optimistic About Amateur Radio

I guess you know I'm not a licensed Amateur, and therefore not eleigible for membership in the QCWA. However, in about another year I shall have been a member of the Federal Communications Commission longer than any other individual, and shall be approaching the quarter century mark of my service on the Commission. Therefore we have a kinship of service longevity, even though not in exactly the same field.

I'm always pleased when Amateurs invite me to participate in their meetings, whether for serious discussions or on the lighter side. I'm especially pleased to be among those who have spent so much of their lives in the business of "communicating," not only on the Amateur bands but in professional capacities as well. People such as George Sterling, Fred Schnell, Bill Halligan, Ray Guy, Howard Chinn, Harold Robinson, your President, Frank Gunther, and many, many others have made significant contributions to mans' ability to communicate via what we call the "ether waves."



Commissioner Robert E. Lee

Tonight I would like to state my opinion of the value of Amateur Radio to our country and also to the world of telecommunication. Much of what I shall say is known to many of you. However, I dug up a few interesting facts bearing on Amateur Radio which you may not have encountered before. It is not my intent to chronicle all the good deeds of Amateurs over the years.

In recent years, however, their performance in emergency situations deserves high marks; such as during the Nicaraguan earthquake about a year ago, and more recently the "Fifi" Hurricane disaster in Honduras. These instances are plus marks in relation to your occupancy of the spectrum.

It is almost impossible to think of Amateur Radio without some reference to the spectrum. Without it there would be no Amateurs. In the allocation table of 1947 after the Atlantic City Conference, the useful upper frequency limit was 40 Gigahertz. After the 1959 World Administrative Radio Conference it was 275 Gigahertz (275,000 Megahertz). With all the expansion of the useful spectrum, it is still crowded and the demands become greater all the time for more and more communication.

The first wireless signals to span the Atlantic ocean back in 1901 were transmitted on 915 meters (328 kHz). By contrast, during the series of Apollo flights to the moon, a frequency of 2,287.5 MHz was used. The power output from the transmitter was only 20 watts, but there was enough antenna gain to produce almost 13 kilowatts of effective radiated power (ERP) from the spacecraft. The engineers tell me that because of space loss in the signal traveling from the moon to earth, the received signal was more than 100 decibels below 1 milliwatt of power flux density.

During the past 75 years, we have been extremely fortunate in respect to the sunspot cycles, which as you know have considerable effect on radio wave propagation. There have been 7 of these cycles since 1900, and 21 since the Zurich Observatory began counting spots on the surface of the sun back in the year 1750. The greater the number of sunspots the better the radio propagation; the higher the "HF" frequency that can be used; and usually the less attenuation of the signal.

FCC Commissioner Robert E. Lee, the senior member of the commission, was appointed by President Eisenhower in 1953 and is currently serving his third term.

Born in Chicago in 1912, Commissioner Lee entered the Federal Bureau of Investigation in 1938 as a Special Agent. He came to the FCC from the House Committee on Appropriations for which he was the Director of Surveys and Investigations Staff.

Commissioner Lee, presently Vice Chairman of the FCC, is a member of the Radio Technical Commission for Aeronautics, and chairman of the U.S. Delegation to the World Administrative Telephone and Telegraph Conference.

Continued on Page 116.

SANTA CLAUS HEARD ON FM. Santa Claus was heard on 2m FM, full quieting from his North Pole residence. His mighty, "HO HO HO," put a lot of smiles on the faces of children unfortunate enough to be confined to Children's Hospital of Washington D.C. Through special arrangements with FCC and hospital officials, members of the Green Mountain Repeater Association Inc., established "Santa's" base station in the hospital's public relation's room and dispatched "helpers" throughout the hospital with FM portables. The picture tells the story which took place in rooms, corridors, clinics and emergency facilities. Wherever there was a child "Santa" made his appearance and debut on 2m FM.

Ham Club Project: Interest The Handicapped in Hobby

Otho Jarman WB6KYM made the papers recently with an excellent article about how valuable amateur radio is for him. Otho is a paraplegic and works both 2m FM and the DX bands. The Barstow, California Amateur Radio Club worked to set him up — he works both phone and CW — code being sent by a voice operated keyer. Otho broke his spine when he was 22, jumping into a reservoir to rescue a drowning child.

While there are hundreds of handicapped amateurs on the air today, there are thousands more people with serious handicaps who could benefit tremendously from the hobby. Helping these people is an excellent project for radio clubs. And please, if your club takes on someone to help — gets them licensed and set up to operate — don't forget to get the local paper out for a story. This will benefit all of us — and will help other handicapped people to learn about the wonders of amateur radio.

Congratulations to W6ZGC, W6FRW, W5UNF/6, W6PVR and WA6MUQ for their work in helping Otho.

Hams Aid Victims in Honduras

Amateur radio operators in the United States, Honduras, Canada and several Latin American nations jointly undertook the responsibility for providing emergency communication service in the wake of Hurricane Fifi, which devastated one third of Honduras.

The day after Fifi struck, September 21, Dr. Enrique Avilar, Minister of Health in Paz, established an emergency communications coordinating committee — COPEN, headed by Honduras amateur operator Alhandro Talbott (HR1ALT).

An emergency base station, HRØCPEN, was set up at Tehusecalpa, and contact to organize amateur support efforts was made with Noel Eaton (VE3CJ), Waterdown, Canada, president of the International Amateur Radio Union, and Harry Dannals (W2TUK), Dix Hills, N.Y., president of the American Radio Relay League (ARRL), an organization of amateur radio operators.

With the assistance of the ARRL and a group of Miami amateurs, four long-range, high-frequency stations, 17 short-range, two-meter FM stations, and a repeater station were delivered to COPEN to fill an urgent need for equipment to provide communications both within Honduras and with the outside world.

On September 21 and 22, more than 200 amateurs in the United States and a larger number in Central America handled emergency messages and requests for

Continued on Page 129

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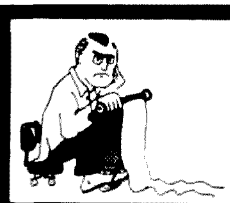


NEVER SAY DIE

...de W2NSD/1

EDITORIAL BY WAYNE GREEN

More and more writing is needed — writing you can do for fun and profit. . .

You don't have to be either a genius or an engineer to make your hobby really pay off — and that's a fact. . .

In addition to articles for 73 Magazine, we have a need for articles which can be used in booklets and other publications — a great need for articles — articles that just about any amateur with any experience can write.

What exactly are we looking for? Well, since most of the articles in 73 are written for the more experienced amateur, with far too little for the rank beginner and Novice we are very much in need of very simple explanations of common things which will help the newcomer to radio and electronics. The Novice needs to understand about antennas — the different kinds that can be made simply and how to use them. He wants to know about how to add a vfo to his rig. How to put in a keyer and how to use it. Why different types of feedline are used and which is best for which application.

How about some articles on basic electronics for photography? How to make darkroom timers — how to hook up slave flash units — sync units for projectors to be used with tape recorders — densitometers — evaluations of kits which are available for building darkroom gadgets — etc.

CBers have an almost inexhaustible need for information to help them along — about CB antennas — matching them — how to use power meters — field strength meters — what vfos are and why they are illegal — what accessories are available and how to use them — all about SSB for CB — info on the 460 MHz CB band and how to use it — evaluations of CB gadgets — CB antenna evaluations — mikes for CB (many CBers have never heard of a noise-cancelling mike) — common CB troubles and how to fix them — how best to mount CB rigs — CB antennas — alarm systems to protect CB gear — etc.

Simple and basic articles are needed in the security field — what equipment is available and from where — simple alarm systems for homes, offices, cars, businesses — closed circuit TV systems — slow scan TV systems — etc. Electronic locks would come under this heading too.

Hi-fi addicts need a lot more info too — how to hook up units — what matches what — how to get rid of hum — how to wire connectors — how to hook up speakers — what mixers are and how to use them — what size amplifiers are needed — what size speakers — what the difference is between all the types of speakers — what kind of wire is needed for speakers, for tape recorders, for turntables, mikes — how to test all these things — how to get rid of hum — what kind of antennas to use for FM at home or in the car — how to use rf amplifiers for the FM receiver — how to get hi-fi in the car — tape decks — cassettes in the car — all about reel to reel tape decks — cassette decks — eight track decks — all about the different types of tape for each application — how about using computer tape?

Speaking of computers — articles on simple computers are needed — what you can get — how to use them — what they can do — how about a home terminal to access a remote computer? Card systems — sorters — new gear on the market in the low price range.

We need to keep up to date on calculators too — particularly the

hand types — what they can do — the newest types and their advantages — accessories for them — new ways to use them — new chips coming out — evaluations of calculators.

SWL info will be good to get too — what to listen for — what receivers are best — surplus equipment which will help — getting QSLs — taping station idents — antennas — SWL clubs and bulletins — books.

In most of these cases we will need articles written by people with a lot of experience and background, not written by newcomers. Oddly enough, new SWLs have little info of any value to others — it takes a good deal of experience and knowledge to understand the field well enough to teach it simply enough for a newcomer to understand it. Thus I expect that amateurs, with their much greater understanding of electricity and electronics, will be able to keep up a good flow of information that will help neophytes to learn — and perhaps eventually get interested enough to become amateurs.

We need hundreds upon hundreds of articles — maybe even thousands. We will pay for them, naturally. So, if you have the ability to explain things simply, then you can make a substantial spare time income by writing for this audience. We expect to be paying out well over $100,000 in the next year or so for articles — is that enough to get you to your typewriter?

Activity is growing on 220 MHz with twenty users on new Connecticut repeater. . .

The fellows down in Hartford put together a 220 repeater by hooking two of the Tempo CL-220's together. As a temporary measure they set the system up to have its output on 223.5 — since almost all of the 220 MHz transceivers are coming through with simplex set up for this channel — and for 223.42 input — since many of the rigs also have a pair on that channel. The plans are to move the repeater to the more usual 223.34 — 224.94 pair soon.

Activity is high, with the twentieth regular user turning up recently — and with one or two new voices appearing every week. The boys really like the band since the range of the repeater seems to be very much like two meters with the exception of there being fewer dead spots in the downtown area and very little of the picket fence fading when in motion.

More and more ops are calling in on the Waltham 220 Clegg repeater too (WR1ABQ), another of the 34-94 systems. This one has very good coverage, with New Hampshire calling in every now and then.

Ops in any area where 220 is growing are asked to drop reports to 73 Magazine so the word can be passed. Let's have those cards and letters — and even some pictures, if you've got 'em. There will be a lot more pictures of activities, clubs, awards, picnics, things like that, if you send 'em in.

. . . WAYNE

SSTV SCENE

Dave Ingram K4TWJ
Rte 11, Box 499 Eastwood Vil. 604 N.
Birmingham AL 35210

As I mentioned last month, the question has been raised of possible dwindling Slow Scan activity. The reasoning for this was that "on the air" activity is only moderate. We asked some of the fellows their opinion on this and here are some typical comments:

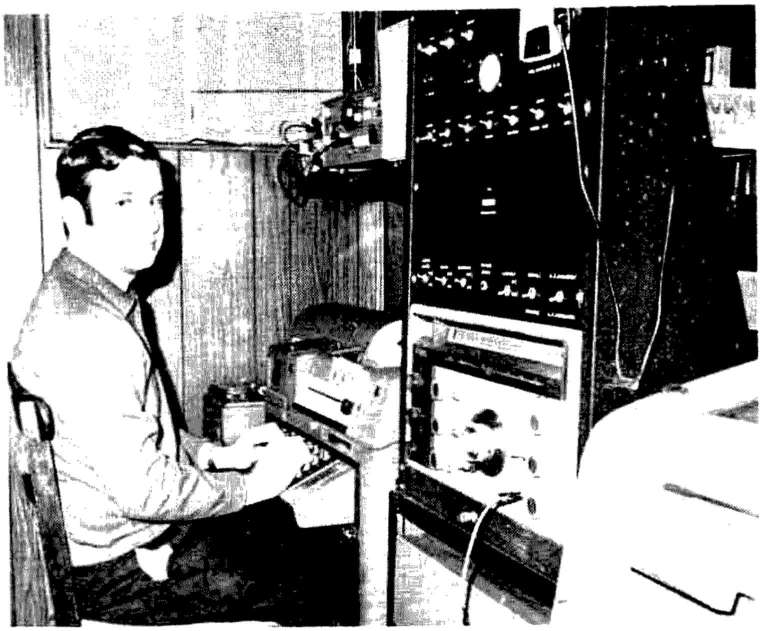
W9NTP — "The Dayton convention's SSTV Forum had standing room only, with newcomer interest very high. Many VHF Fast Scan operators have shown interest in Slow Scan, especially with the availability of Direct Fast to Slow Scan converters." WØLMD — "Possibly after newcomers buy SSTV gear and send pretty girl pictures for a month or so Slow Scan becomes meaningless. However, non-technical operators can still serve many valuable purposes on SSTV if they are seriously interested."

K2KEY — "The number of new SSTV calls on the net each week indicates Slow Scan is growing tremendously." WA7MOV — "Summer vacations and poor band conditions naturally reduce on the activity. Many fellows watch and listen but do not transmit SSTV. I feel the increase in SSTV activity is still phenomenal." W6KZL — "Hundreds of amateurs have built linear amplifiers but shy away from building a Slow Scan monitor. Older hams may not understand solid state circuitry and are timid about getting into it. Newer fellows, unless the engineering type, find circuitry a little over their heads."

W8OZA — "Many non-Slow Scanners comment they are hearing SSTV stations spreading across the band more lately. I've found SSTV interest in homebrewing and experimenting extremely high." W1JKF — "I feel SSTV is just beginning to go, and the best is yet to come."

Personally, I feel SSTV is growing tremendously but presently this growth is primarily technical, and off the air. Many Slow Scanners are busy building rather than operating. Watch for a boom in activity when this hits the air.

How closely the previous opinions parallel those of scanning disc television in 1925! DeForest, inventor of the "Audion" or three element tube, had this to say when asked about disc television. "Once the novelty has worn off there is nothing in the present limited images which will interest, amuse or instruct the average non-technical person." Another noted individual was Dr. E. F. W. Alexanderson. He transmitted the first television pictures from New York to New Zealand during the early 1930s. (These



Melvin Schneider K2KEY

disc pictures were audio tones similar to Slow Scan TV.)

He reasoned some early non-technical wireless operators lost interest like this: "There is nothing in the present crude system to hold one's interest once the novelty of seeing pictures has worn off." We must remember Slow Scan TV is still in its infancy. Radical innovations like SSTV are slow being accepted because people resent change.

Logic State Probe

Paul WA8TMP sent us two unique ideas using the bi-color light emitting diodes first mentioned in the August column. One of these suggestions is a logic state probe which should prove indispensable for designing and troubleshooting. The circuit is shown in Fig. 1 and will give the following indications: High-green, low-red (depending on which way LED is installed), open-no indication and pulsed-LEDs light alternately proportional to duty cycle.

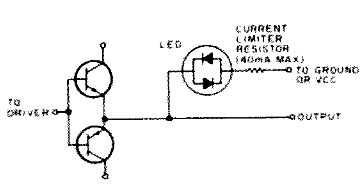


Fig. 2.

The second suggestion is for using the LEDs to monitor the state of a complementary output circuit. An example is shown in Fig. 2. Thanks Paul, for the information.

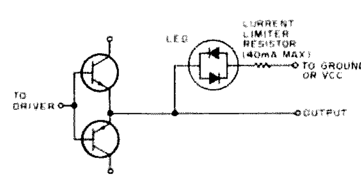


Fig. 2.

SSTV Happenings

Here's the latest ramblings on what's happening in Slow Scan TV. WA7MOV is receiving good quality weather satellite pictures from ATS-1 and ATS-3 using a VHF receiver (136 MHz) and modified Robot monitor. Often he transmits some of these pictures on the SSTV net, which meets Saturdays at 1800 GMT on 14.230 kHz. Talk is he's working up an article on this for the magazine. WØLMD is busy developing his Mark 2 version of the Digital Slow to Fast Scan converter. This converter interfaces a regular television to your HF receiver and results in fantastic pictures. The heart of this unit is a large MOS shift register. Present surplus chip cost places this system in the $400 range, but future price reductions are expected. Write Bob for more info.

I1LCF reportedly has designed a European version of the SSTV keyboard and has information available to interested parties. He also has a weather satellite monitor working very well. WA2ZDF/CP1 reports the Bolivian Government has placed a temporary ban on transmitting SSTV. Officials are studying this "new" mode, while locals display systems, so the ban shouldn't last long.

W3GKC is producing PC boards on the W7ABW plumbicon camera. (Details in SSTV Handbook.) This seems like the perfect way to build a good quality camera. W9LUO is producing PC boards on his solid state SSTV monitor which appeared in QST during 1972. This seems like the perfect way for newcomers to get started in SSTV. All you need do is to put components on the board and follow some simple external wiring and a fine quality inexpensive monitor results. PC boards can't be miswired like regular circuits.

W8OZA is making PC boards on the WØLMD SSTV keyboard and scan converters. If you would like to attempt some modern digital circuitry this looks like the perfect answer. PC boards are really nice when building involved gear. W6MXV is producing his top-notch monitor in a variety of kits, according to desired parts and cost. Write Mike for the full story.

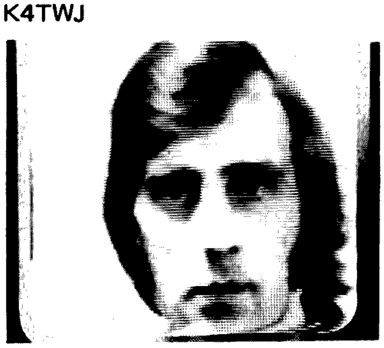
A few month's back I had a brief description in this column of 1925 style TV, which was one of the very first systems aired. Since that time I have submitted a request to the FCC for special permission to transmit 1925 style TV signals on a three minute one-time basis. I will, hopefully, transmit these nostalgic signals on 80 and 20 meters during the early part of 1975 commemorating the 50th anniversary of television. Additionally, I am writing an article complete with pattern cut-out of scanning disc, descriptive information on an inexpensive (less than $10) receiving unit and schedule of transmission. (All you really need is an ac motor, light

dimmer for speed control and 2 to 4 LEDs to get a unit going.)

My first reply from the FCC came from A. Prose Walker and was, naturally, discouraging. However, the reply indicated my request obviously was not read, so I am still pushing for authorization. It's difficult for me to understand why we are being pinned down so heavily by regulations. Are we expected to be a simple bunch of operators with no incentive? I don't think so.

Should all airing attempts fail, I will still have info and tapes available via mail for the cost of an SASE. These disc signals sound like a poor quality 1000 Hz note. If the idea of actually receiving these unique TV pictures appeals to you why not drop me a card with your opinion. It's rather difficult pushing a project like this with only a handfull of hams interested.

K4TWJ



W1JKF and XYL

I would especially like to thank W1VRK for the fine photos in this month's column. Gene, in addition to being quite active himself, is responsible for getting many fellows interested in Slow Scan. Possibly you remember his introduction to SSTV article a couple of years ago.

K4TWJ

Bill Pasternak WA2HVK/6
14725 Titus Street #4
Panorama City CA 91402

Some must have thought it real fun to hang up someone else in the middle of a call. Others thought the real fun was to dial up the local time and then leave the system "off-hook." Another group thought that the few simple rules concerning identification and call content didn't apply to them. Perhaps though, the most decisive factor was the apparent feeling by many users that this machine, like all others, was their god-given gift to use as they saw fit showing little regard to the wishes of the owner or licensee — least of all the FCC regulations.

Then too, there were the jammers those sick, warped minds that get their kicks by making life miserable for everyone else. Last and of greatest importance was the apathy on the part of most of the users not to do a damn thing about what was going on. The typical attitude was to leave it to the licensee to clean up the mess or let "Joe Ham" do it! So the licensee did "do something;" he was forced to close the WR6ACK "open" autopatch and return the system to a local area open repeater.

When Doug Andrews K6VGH, owner of WR6ACK and Fred Deeg K6AEH, its licensee, put the autopatch function into operation, it was made clear to all potential users that it would take their complete cooperation and total adherence to the rules for the first "Big City" open autopatch system to be a success. An open autopatch in a city like Los Angeles had never been tried before. Unfortunately, in short order 'ACK became a fad. Everyone rushed to hook up a touchtone pad to their radio and join in on the new thing, whether they really had a valid need for it or not. No matter what repeater you were operating there was always someone who would break into your QSO for a check on how their tones sounded.

On the system itself, some of the most useless calls were made, like someone sitting in his driveway and calling his XYL in the house to tell her he was home. Few really cared about the fact it was someone else's station license and that the licensee was responsible for the legal operation of the system. This is an important point that so few VHF repeater operators realize.

Neither Fred nor Doug wanted to turn the autopatch off and appealed to the users to "clean house" and quit the kid-stuff. They even tried turning off the autopatch function for a few days in the hope this message would motivate the people that really cared into doing something. Alas, when the autopatch came on again, so did the garbage. Seeing no other alternative, and wishing to adhere to the regulations as set forth by the FCC, the autopatch function was permanently taken off in mid-September. The WR6ACK Open Autopatch killed by apathy!

Los Angeles has witnessed some fantastic growth on 220 MHz this past year. At present, it is safe to assume that the L.A. area probably accounts for 50 percent of the FM repeater activity when compared on a national scale. When the call "220 — Use It or Loose It!" rang forth, Southern California was quick to respond and did so in a big way. To date, the SCRA has coordinated some nineteen channel allocations of which eight are already in full-time operation.

The first to get on was WR6AFG, 222.38-223.98 from atop Johnstone Peak. Sitting at the east end of town, this system provides coverage of Pomona,

Riverside and most of Orange County. Much of the credit for getting AFG, which is an AREC Repeater on the air must be given to an old friend of mine named Mike Santana WB6TEB. I've known Mike for a number of years back when he was known as WA2AZX and he has always been in the forefront of trying someting new. Out here it was 220.

Close on the heels of AFG came WR6AER, the first successful .34-.94 repeater in Los Angeles; even if that had to be 222.34-223.94, rather than its two meter counterpart. AER, built by Bill DuHaime WA6NTW and Warren Andersen WA6JMM, has fast become the "people's gathering spot" on 220 and accounts for a good part of L.A.'s total activity. Though it was originally designed to cover the L.A. basin, quite soon it became evident that the site offered more than expected. From Long Beach, Orange County and San Diego the system attracted users. One day recently, while on a trip to Palmdale, Warren was surprised to find that he could work the system, good copy right over a range of mountains, doing so with a 10 watt Midland radio and a ¼ wave whip!

The AER system is composed of an all solid state RCA Super CAR-FONE receiver strip driving the transmit portion of a Midland 220 radio. However, at this writing, Bill is hard at work converting a Micor transmitter to replace the Midland and free it for other service. To date, after almost a year of day-to-day service, the system has never been off the air due to equipment malfunction, either rf or control, much to the credit of Bill and Warren.

Not to be left out by any means, the gang from Sulphur Mountain have 222.42-224.02 active with WR6AEP, as part of and in conjunction with their WA6SIN Remote – WR6AEP Repeater system on both two and 220. In Hollywood, WR6ABJ keeps 223.14-224.74 humming and to the Northeast at Crestline, WR6ACJ is to be found on 223.26-224.86. Finally, a recent addition is WR6AGH in Hall Canyon on 222.46-224.06. There are also a number of private closed systems operating and plenty of simplex on 223.500.

Along this line, I had a late evening talk and snack with Warren WA6JMM the other night. Our discussion centered around establishing a National Repeater Calling Channel for 220. If now, while activity on 220 is still in its formative years, we can agree nationally on a primary channel for "first repeater in the area" allocation, then in a few short years it may be possible to drive coast to coast with but one set of crystals in your radio (a single crystal in the case of the Clegg FM-21) and never be out of radio contact. Warren suggested the 222.34-223.94 pair since it can easily be remembered when associated with its two meter counterpart.

Whatever channels are chosen it must be started now to insure success in the future. Both Warren and I would be interested in your feelings about this and please do not hesitate to write.

Back to two meters. At the present time all available 30 kHz split channel allocations statewide have been assigned and are in use. But constantly, both SCRA and CARC are being bombarded with requests for new assignments by those who want a two meter system of their own. Like it or not, there is only one way to increase the number of available repeater channels and that is to split the separation in half and allocate these split-split channels. For a while, it was believed this would be an overwhelmingly approved statewide move. At this writing, however, Northern California has elected to stay with the present system and allocate the split-splits only when no other alternative can be found.

As to this area, the decision will be made at the November SCRA meeting. IRumors are that at least Southern California will go split-split. We already have a successful system on .295-895. Next month we will bring you an update. In case you are not familiar with split-split allocations and the trials and tribulations they entail, may I refer you to "Can Split-Split Channels Really Work" to be published soon.

In closing this month, Sharon and I wish each of you the best of Season's Greetings and happiness in the New Year. May it be one of building together for Amateur Radio's future growth and prosperity.

Schley Cox WN9LHO
219 Kilgore Avenue
Muncie IN 47305

QSL?

Some Novice operators are confused about when and how to send QSL cards and many are frustrated about not being able to get return QSLs from some states and DX stations.

Back in the good old days when I was KN4EMX there were quite a few operators (including myself for awhile) who sent QSLs to every new contact. Postage was three cents and the cards were cheap.

Today postage has increased 166 percent and QSL cards are expensive enough so that some operators never bother to get any. The idea today is to QSL only when one or both operators need the other's card. Most of us couldn't afford to send a card to every new contact anymore anyway.

Here are a few ideas on getting your share of the cards:

You can't complain about not receiving any if you yourself don't have QSLs to send. There are still some good deals on printed cards (73 Magazine's QSL selection, for example) and there is no law against homemade cards.

The kind of information to make sure of on your card is generally the same kind you include in your log – date, time, calls, frequencies AND something that confirms that a two-way contact actually took place. Without

that confirmation the card is not really a QSL card.

Some award committees throw out cards with calls or dates crossed out and correct information written in. If you miswrite information on a card throw it out and write a new QSL card.

It's perfectly all right to write in additional information on a card such as portable QTH and the slant bar portable sign after your call letters, and to change the Novice N to a General B when you upgrade your ticket.

When you need a card from a state, and the QSL exchange is your idea, send along an 8¢ stamp with your card in an envelope. The whole package will cost you nearly a quarter but it's more likely you'll receive a reply, especially from some of the rare states like Delaware and Alaska. Of course, if it's the first time the KL7 on the other end has worked your state and it's the first time you've worked Alaska, there's no need for anybody to include extra stamps with the QSLs.

DX QSLs aren't much different than those from the rare states. Most of the DX stations you will work won't need your card. Sending you one of theirs is not just a courtesy on their part but may be a financial burden also.

With so many WN stations chasing so few DX, in most cases it is a good idea for the WNs to pay the DX postage bill. The only way to do this is to send the DX station an International Reply Coupon. The coupons, available at most large post offices, are redeemable overseas for postage in that country good for a surface letter or QSL card back to the US. The IRCs cost 26¢ each. Send two for airmail returns. Sending them with your card may cost a lot more but it also takes the postage burden off the besieged DX station who is nice enough to get up into the US Novice portions of the bands.

The DX station probably will send his card to you via your local QSL Bureau. Make sure you have a stamped, self-addressed envelope large enough for QSLs on file with the bureau manager. Good hunting!

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

The following comes from Ken WB4MXC, 191 Biesecker Road, Lexington NC 27292. "The North Carolina Six Meter Association is now one month old and has about 30 active members. We figure this is at least 75 percent of the active six meter operators in the state. We are offering a nice certificate for working five member stations. Rules are simply log data for contacts after September 1, 1974 with $1 to WB4MXC, at the above address. We have a fine net on Sunday mornings at 0900 (1300CUT) on 50.12 MHz SSB. All station are welcome to check in. Our aims are simply to increase six meter interest and activity in our state. Other activities planned are member contests, annual picnics, a newsletter every couple of months and most important a lot of good old fashioned fellowship.

I would be interested in hearing from other state and regional groups of this type. Perhaps a mutual exchange of newsletters could be arranged to allow each group the benefit of the experience of the others. If each group will send me a copy of their publication I will see that duplicates are made and distributed to the interested parties.

From Dallas WA5IKU says September was slow with only a few 4s worked plus the locals. Perry says the city of Dallas will not issue a permit to erect a tower of over 24 feet. If you pay a $40 fee for a permit they will allow a maximum 36 foot tower. Local clubs are attempting to get the ordinance reversed.

Monte WB2EYF says after living in apartments he is very happy to be a homeowner and can't wait until his Swan 250 arrives. He has been stuck on 2 FM for a long time and looks forward to a good six meter band opening. Monte passes along news that the local VHF club, the RAM Association, is sponsoring a new six meter repeater, WR2ADK, with input on 52.68 and output on 52.525 with 360 Watts ERP. The split site machine consists of RCA LD units located in Pleasantville, New Jersey.

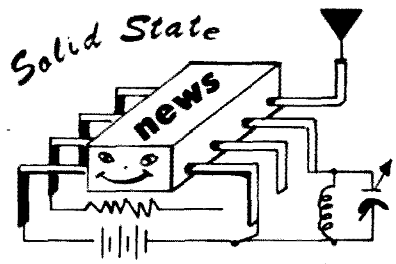
From Florida, WB4OSN says, "Even the September VHF contest was a bust as conditions were El-Stinko." A few 1s and 2s were worked there on Sunday. Joe says he has been busy on 10 and 15 trying to inspire six meter interest in Central and South America. The suggestion has been made that stations with the capability monitor 28.53 weekends as a way to exchange ideas, what's been heard, etc.

Ray K5ZMS says six has been slow but he doesn't seem to mind too much. "It gave me time to spend with my family...I have been so busy getting SMIRK on the go. We now have 547 members in 44 states and 12 countries. I am starting to get back reports that the TVI education program is starting to have some effect and that members are using it to combat and end neighbors' TVI difficulties. I would like to hear from more who have used the info to help a neighbor rid themselves of their TVI problems."

The October 6 — 6 Club newsletter contains several items of interest. First and foremost, the membership has reached the 171 mark and is nationwide. The twenty latest members represent eight call areas. The latest state representatives are: Mighigan WB8MXP, 1692 Mandigo Road, Kalamazoo 49002; and Texas WB9KPC/5, RR6, Box 515, Paris 75460. The group around Ashland, Kentucky conducts a "Band-Aid" net every evening on 50.14, members monitor 50.11 too. The Kokomo, Indiana Amateur Radio Net is held each Sunday on 50.7 at 2100 CUT. And finally, each morning from 1230 to 1330 CUT a group meets on 50.110 for a ragchew session. These fellows hail from Indiana, Kentucky and Ohio.

The VHF Handbook for Radio Amateurs by Bill Orr of Eimac and Radio Handbook fame and

Continued on Page 129



Waller Scott K8DIZ
7318 Hollywood Drive
West Chester OH 45069

Recent advances in solid state electronics have resulted in the marketing of a wide variety of test equipment that should be of interest to the ham experimenter.

Digital voltmeters have become available at ever decreasing prices. Some are battery powered and the cost is much less than designs of several years ago. Accuracy is much improved, considering the price range of these instruments, (i.e. Hewlett Packard's Model 970A hand held probe type DMM, 3½ digits, N 1% dc volts accuracy for $310.00). DMM's aren't likely to replace the conventional multimeter in all applications though.

While accuracy of reading increases with DMM's, changes in the measured voltage, or current, that occur too fast for the digits to be read, result in a meaningless reading of blurred numbers. The faithful analog meter still shines in the realm of peaking type measurements, as in receiver alignment, or in measuring fast drifting voltages. DB measurement is still more readily attained with the analog meter.

Waveform generation equipment has begun to appear on the scene at quite surprising prices (i.e. Wavetek's Model 30, 2 Hz to 200 kHz Function Generator – SINE, SQUARE, and TRIANGLE waveforms – $149.95, all solid state and battery operated). Most of these new generators cover the frequency range of from 0.01 Hz (that's 100 seconds per cycle!) to 1 MHz. Some of the more expensive go to 11, 20 and even 30 MHz on the top end. This isn't much compared to a regular CW signal generator, but these instruments generate many complex waveforms, far beyond the capability of a standard RF signal generator.

The circuitry behind the scenes in these new instruments is often one or more custom designed ICs with associated control and switching elements. These elements switch the IC into the correct frequency or voltage range and provide the proper type of output, be it digits of display or voltage output of the proper waveform.

Experimenters who feel that even the new lower equipment prices are still a bit steep for the average budget, will be pleased to learn that most of the complex functions performed by these instruments are available in special function ICs available through manufacturer's distributors or 73 advertisers.

This month we'll consider the generator type ICs and some multimeter types next month. The generator IC is usually referred to as a Function Generator because of the multiple output waveforms it generates. Some of the more common waveforms available from function generators are: SINE WAVES, SQUARE WAVES, TRIANGULAR WAVES, RAMPS or SAWTOOTHS, and PULSES. In addition to the variety of waveforms available, a number of control modes and modulation types are available.

The frequency of the generated waveform can be varied with an ac or dc control voltage (voltage controlled generator—VCG), sometimes even referred to as FM! The waveform can be "gated" off and on for any desired duration by an external input. Outputs can be "triggered" into momentary single cycle operation. Amplitude modulation (VCA) can be obtained or the AM control can be used as an output level adjust. The frequency of the generator can be swept from F1 to F2 and then reset to F1 to begin another sweep. In this case, an external ramp signal is required. The symmetry or duty cycle of a waveform can be adjusted with a pot. Square waves can become pulses and triangles ramps.

By now you can probably imagine many different uses for these circuits. A logical choice would be a function generator test instrument which could be as simple or elaborate as you choose to make it. Perhaps your requirements would be met by a low frequency sine and square wave generator with no need for the other controls and output waveforms. On the other hand, a complete audio to rf frequency sine, square and pulse generator with gate, trigger, sweep and symmetry controls may be just the thing for a more serious experimenter.

These circuits aren't limited just to test equipment applications. Frequency shift keying (FSK) voltage and current to frequency conversion, DSB with suppressed carrier, simultaneous AM and FM, phase shift keying (PSK) tone burst, crystal control, and phase-locked-loop operation are all possible with function generation type ICs.

Some of the units have more capabilities than others. The basic

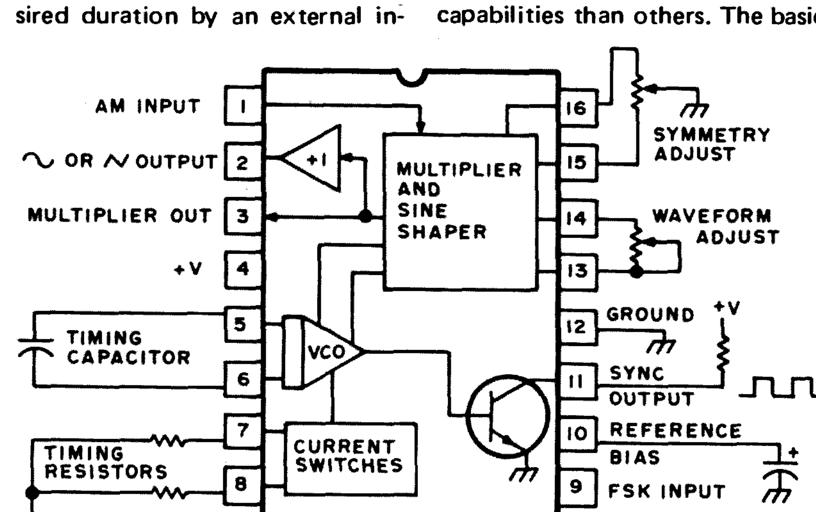


Fig. 1.

Characteristic	XR-205	XRS-200	XR-2206CP	XR-2207CP	8038BC	LM566CN NE566
Sine Wave	X	X	X		X	
Square Wave	X	X	X	X	X	X
Triangle Wave	X	X	X	X	X	X
Ramp	X	X	X	X	X	
Pulse	X	X	X	X	X	
FM	X	X	X	X	X	X
AM	X	X	X			
DSB	X	X	X			
FSK	X	X	X	X	X	X
Sweep Range (F2:F1)	10:1	10:1	2000:1	1000:1	1000:1	10:1
Symmetry Adjust	X	X	X	X	X	
Max. Frequency	4 MHz	30 MHz	1 MHz	1 MHz	1 MHz	1 MHz
Supply Voltage	8-26 V	6-30 V	10-26 V	8-26 V	10-30 V	10-24 V
Package (dip) Pins	16	24	16	14	14	8
Manufacturer	Exar	Exar	Exar	Exar	Intersil	National Signetics
Aprx. Price Each	$12.05	$28.90	$5.50	$4.15	$5.75	$2.50

Operating features of function generator IC s.

component of the system is a stable voltage controlled oscillator (VCO). The VCO generates the basic periodic waveform. An external timing capacitor is usually charged and discharged with a constant current providing a linear triangle or ramp waveform. The VCO is usually followed by a wave shaping circuit which performs triangle to sine conversion or symmetry adjustment. Then an AM modulator would follow, if included. Lastly, an output buffer stage is included to provide adequate drive levels to the load. Fig. 1 shows the block diagram of a new and versatile IC, the XR-2206CP.

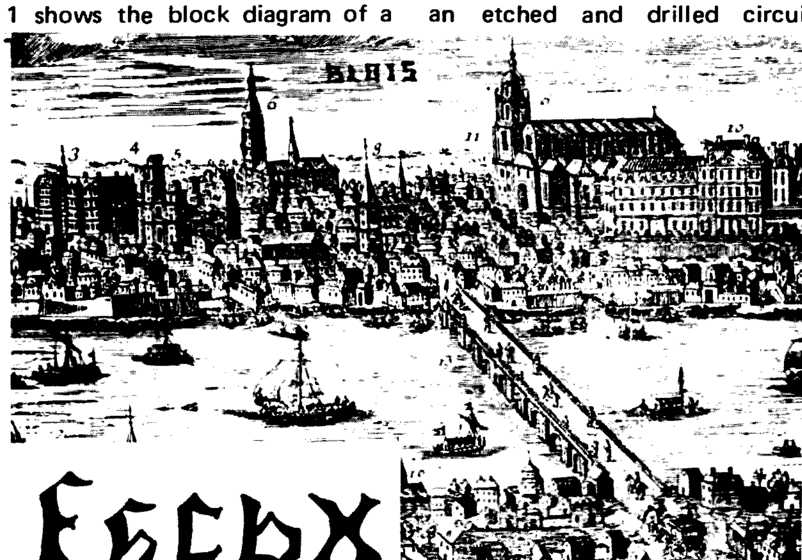
The chart above lists some of the important operating features of a selection of function generator ICs.

Exar offers an excellent AM/FM generator kit (XR-205K) for $28. This kit contains two XR-205 ICs. One IC is used as a carrier generator and the other as a modulator. CW, AM, FM, FSK and PSK waveforms over the frequency range of 1 Hz to at least 5 MHz can be obtained. In addition to the two ICs the kit includes an etched and drilled circuit board, a component list of other required components and their approximate prices, and detailed assembly and hook-up instructions.

Data sheets and application info on these ICs are available from the manufacturers at addresses listed in the July column, except for Intersil Inc., 10900 N. Tantau Ave., Cupertino, California 95014, and Signetics, 811 East Arques Ave., Sunnyvale, California 94086.

Merry Christmas and Happy Experimenting!

. . . K8DIZ



Jean Claude Miceli F6CBX wins the one year subscription this month with this interesting etching depicting life in Blois, France around 1650. Blois, his home town, is located in the Chateaux region, 180 km from Paris. Keep sending your entries to 73 Magazine, Peterborough NH 03458.

ANOTHER FCC BOLLIX

A repeater group in Ruston, Louisiana managed to get its license approved and issued — only to find that Gettysburg had screwed up and issued them a WR4 call instead of a WR5. They quickly returned the license (in early March) and waited for the correct call to be issued. They are still waiting as of the end of October. FCC officials in Washington have advised that they go ahead and use the WR4 call until the correct call arrived. Visitors to the area are warned not to worry about working through WR4AFN while in the 5th district.

News Pages Continued on Page 114

LETTERS

CLEVER IDEA

Thought you might be interested in a new trend that is developing within repeater clubs.

Pictured are the decals purchased by the Metropolitan Repeater Assocation WR2ACD and the Mt. Beacon Amateur Radio Club WR2ABB.

Both groups are offering one free decal to each paid member. Additional decals for members as well as interested hams may be purchased at $1 each. It is generally preferred that a station work the particular repeater, thus having the decal become a form of "QSL," though this is not really necessary.

Persons interested in purchasing decals should contact the following, enclosing a large self-addressed, stamped envelope and a dollar for each decal.

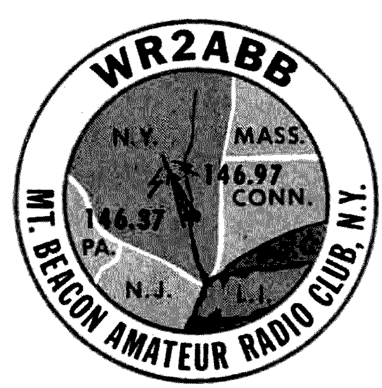
For WR2ACD: Tom Provost, WA2YJF, 146 Merrick Rd., Lynbrook, N.Y. 11563.

For WR2ABB: Ron Perry, WA2CGA, RD 1, Glen Ave., Fishkill, N.Y. 12524.

More information on design and purchase of these decals can be secured from Mike Shaner, WA2GGE, 938 N. Ontario Ave., Lindenhurst, N.Y. 11757.

The decals can be good money makers for a club or a nice little extra for dues-paying members. In either case, they are different and distinctive.

Ron Perry WA2CGA



WOMEN SAILORS

Being a seagoing "sparks," I read with some interest your article in the September issue on Gloria Vader, the "first YL Maritime op". She is probably the only one at the moment but is certainly not the first.

Shortly after the Second World War the American Communications Association, CIO, now known as the American Radio Association, AFL/CIO, and the larger of the two unions of seagoing radio officers, called for an NLRB election in a small company running out of New York to Europe and won the election. Under the terms of the law, since the union won, all radio officers who voted in the election were entitled to full books in the union.

Much to the consternation of the union officials, and later the steamship officials of various companies the union had contracts with, one of the radio officers voting in that election, although named Billy Adells, turned out to be a woman. At that time, and practically the same today, the only women on American ships were on passenger ships in the steward's Dept., nurses, telephone operators, etc. However, there was no choice, under the labor laws, and she applied for and received her full book in the union.

Around 1947, Miss Adells quit her ship and registered at the union's hiring hall in New Orleans on the rotary hiring list. Eventually her turn came around and she took a job on the S/S Gulf Banker, a 10,000 ton freighter, also carrying 12 passengers, of the C-2 class. It belonged to Gulf & South America Line, owned jointly by Grace Lines & Lykes Bros. SS Co., a steady run from various gulf ports to the West coast of South America. Amongst seamen it was considered a good ship, a good company and an excellent run.

Up until 1949 the radio operator on a ship was not legally an officer although all the rights and priveleges of such were extended to him, or her in this case. In 1949 Congress, at the instigation of the union, passed a bill legalizing the officer status of the R/O aboard ship. The USCG Bureau of Merchant Marine Inspection then issued a "Radio Officer's License", the qualifications for which were that one had to have a "valid 2nd or 1st class radiotelegraph license issued by the FCC", take a first aid test and pass a cursory physical. Miss Adells applied for the license in New Orleans and was turned down because she was a woman. She immediately started raising cain, asked them to show where the law mentioned sex, threatened to sue, etc. They caved in and issued her the license. This was 20 odd years before women's lib.

In the early 1950's Miss Adells quit the S/S Gulf Banker, and the sea, and went to school. She then set up practice in Houston, specializing in felines, and, as far as I know, is still there practicing.

However, around 1967 when there was a shortage of radio officers due to ships being brought out of the boneyard for the Vietnam sealift, Miss Adells made several trips on a big bulk carrier, belonging to Bethlehem Steel, hauling grain to India. After that she went back to her veterinarian practice and that is the

last I have heard of her.

Some years ago I heard of a captain on a tanker of a small independent company who had his wife signed on as 2nd radio officer. How much of her duties were radio operating and how much were "wifely" I don't know. These are the only two women R/O's on U.S. ships that I have heard of although there might have been more before my time, which would have been before the Second World War.

The Scandanavians, particularly the Danes and Norwegians, carry quite a few women R/O's on their ships, sending them to government schools for training.

I have been asked many times how one qualifies to become a seagoing R/O. The primary thing, of course, is to have at least a 2nd class telegraph license, and the USCG radio officer's license, plus seamen's papers, commonly known as a "Z" card, with the proper endorsement.

However, 99.9% of the ships only carry one R/O and in order to qualify for those jobs one must have a "6 months sea experience" endorsement on the FCC license. This is rather hard to get. Seatime on a foreign ship is not recognized – it must be a U.S. vessel. See subpart "F" of FCC rules & regulations, Part 83.

Years ago it was common to get this time as a junior R/O on a passenger ship but passenger ships, under U.S. flag, are now few and far between. The only other way is to sail on a non-compulsory equipped ship, which are smaller vessels such as seagoing tugs, research vessels, etc. I'm not sure of what the cutoff tonnage between non-compulsory & compulsory ships is. It must have, of course, in order to qualify, a radiotelegraph station, a watch stood on 500 kHz which is the CW international calling, answering and distress frequency and be open to public correspondence. For this reason the FCC has never recognized Navy seatime as they do not stand a watch on 500 kHz. At one time, and possibly still, the FCC did recognize USCG time on the weather ships as they stood a watch on 500 kHz, handled traffic with merchant ships, etc.

Some years ago there was an electrician on a ship with me, who is W5JDK, who had the proper, commercial licenses, but no six months. For about a year with the captain's permission, he came to the radio room, stood a regular watch, signed the log, and got his time in that way.

If Ms. Vader's survey ship has a W/T station she can, after six months, have the captain endorse the back of her license, go to the FCC, get her endorsement and be fully qualified to sail any ship, except chief on a passenger ship which requires a first class license.

With the rare exception of women in the stewards department there are no women, presently sailing on oceangoing vessels of the U.S. Recently though the U.S. Merchant Marine Academy in Kings Point, N.Y. accepted 15 women midshipman (midshipperson?) who, during their 4-year course will spend a year at sea as coadets on merchant ships. When, and if, they graduate in 1979 they will receive licenses, as either 3rd engineering officers or 3rd mates (deck officers), be commissioned in the Navy Reserve as ensigns, and in the case of the deck officers as line officers, receive a B.S. degree. I believe the California State Maritime Academy at Vallejo has also taken in some women to train as ship's officers. Why not women radio officers?

Richard F. White W6UKK
Radio Electronics Officer
S/S Genevieve Lykes/WZJA

CRYSTALS WANTED

I am a proud owner of HEATH HW 32-A. In spite of all I am gloomy due to its restricted coverage. I would be grateful if someone could send me crystals of 18.075 and 18.175 MHz so I can cover whole 20 meter.

R.D. Gupta VU200
3, Naya pura
Guna 473001
India

TRY HARDER?

With reference to Ernie Opel's W7YTE comments in the Sept. issue, once again the fellows in Washington must be spending too much time floating face down in the Potomac. As in Seattle, they must not have tried too hard to push 25W erp through some of the granite hills in the New England area. I admit we shouldn't expect commercial quality coverage from the run of the mill 15W mobile and the restrictions on power from the machine does tend to make one hang up the mike and talk to oneself. (At least it's full quieting). I don't want superpower but why can commercial two-way repeaters be licensed at 60-100W out, then that going up to 6-10 DB gain antennas? It's only a hobby but sometimes it counts for more than that.

Daniel J. Szymanski
Ellsworth, Maine

TR-285 CONVERSION WANTED

Thank you for the letter informing me of your magazine shortly after I received my Novice ticket. I have been reading 73 for a few years and am already a subscriber. In my opinion, no other magazine can compare with the quality of 73. I am now a General class license holder. Recently I acquired a few RT-285/URC-11 walkie-talkies for 243MHz air emergency. I would like to convert these for use on the 220MHz amateur band. I would greatly appreciate it if you could possibly get me in touch with anyone who has performed this conversion or anyone who could get me a schematic of this unit. Thanks again for the best magazine for radio amateurs, and three cheers for Wayne Green!

Thank you for your assistance.

George Galloway
P.O. Box 2488
College Station TX 77840

Letters Continued on Page 121

Peter A. Stark K2OAW
196 Forest Drive
Mt. Kisco NY 10549

How To Make Nicads Behave

Nicad Care – A to Z

Many types of portable gear use nickel-cadmium rechargeable batteries (Nicads). Though these batteries last a long time if properly used and cared for, abuse them and you will find that they will die in a short time. Perhaps this article will show you how to treat them right.

Nicad Types

Nicads come in two types, vented and sealed. The vented types usually have a liquid electrolyte and therefore have to be kept upright. During normal operation (charging and discharging) there are gases generated in the battery, which leak out through the vent. You therefore have to fill the battery periodically with de-ionized water to make up for the electrolyte loss. In this respect, these vented cells are similar to the common lead-acid batteries used in cars. Sealed Nicads, on the other hand, can be used in any position and do not require the adding of water at any time. They also have a vent, but this vent is used only as an emergency pressure release in case the gas pressure inside gets too high due to improper use. Once some gas escapes, the battery starts to dry out and the electrolyte cannot be replaced.

Both of these types have their good points and bad points. The sealed cells are, of course, easier to use in portable equipment since you can turn them at any angle without worry. But since it is important not to generate enough gas pressure inside to cause venting, the sealed Nicad usually has to operate at lower currents. Vented cells may be more awkward to use, but they can be made more powerful and in larger sizes. Since the electrolyte can be replaced or added to, the vented cell can stand more abuse, larger charging and discharging currents. In fact, a common application of vented Nicads is to run the starter motor on large aircraft engines; they can stand tremendous currents, and are usually smaller and

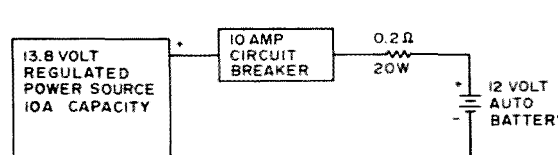


Fig. 1. Constant voltage auto battery charger.

lighter than lead-acid batteries of the same electrical capacity. In amateur applications, of course, we don't need such large currents, and so the sealed battery is the one commonly used. This article will cover the sealed type only; the most commonly used battery sizes are the standard AA, C and D sizes, as well as a few special purpose types such as the 15V batteries used in Motorola HT-220 2m rigs.

Nicad Voltage

Unlike the voltage of a standard dry cell, which starts high and steadily decreases during its discharge, the voltage of a Nicad is remarkably constant during its service life. Shortly after a full charge, the voltage of a Nicad cell may be as high as 1.45V or so, but shortly after that the voltage drops down to somewhere between 1.2 and 1.3V. It then stays there for most of its discharge until, when it reaches close to being completely discharged, the voltage suddenly starts dropping toward zero. When it reaches somewhere around 1.0 or 1.1V, depending on the manufacturer, it is considered discharged since from that point on its voltage is considered below a useful level. This 1.0 or 1.1V level is therefore useful in determining the overall charge the cell can store. Note that we are talking here about a single Nicad cell, in a battery consisting of many cells, the total voltage would then be the sum of all the cell voltages. In this discussion we are talking only about a *single* cell.

The interesting thing is that, even if you completely discharge a Nicad down to 0V, as long as you do it slowly and don't keep the load on for too long afterward, as soon as you remove the load the cell voltage will start climbing again to somewhere above a .5V. This is a strictly low-current condition, since any load placed on the cell at this point will simply bring the voltage back down to zero again. But it is a simple, useful test of a cell. As long as an open-circuit cell has at least .5V or more across it after you leave it sitting for a while, it is probably not dead. On the other hand, if the cell voltage is zero even under open-circuited condition, then most likely the cell is dead and no matter how much you try to charge it you won't get anywhere.

Nicad Capacity

The word capacity refers to the total charge that the battery can store and supply to its load per charging, and is usually measured in ampere-hours or milliampere-hours. For example, a 100A Hour battery (and that's big) should be able to supply 100A to a load for one hour, 10A for 10 hours; or 1A for 100 hours, before it goes "dead." This is a simple explanation, but there is more to it than that.

First of all, the faster you discharge a battery the less total energy you get out of it per charge. That 100A hour battery we are talking about here might deliver 100A for an hour, but with only a 10A hour load it might be good for 11 hours, rather than only 10. At a 1A load you might get 115 hours, rather than the originally assumed 100 hours. How do you then rate this battery – 100A hours, or 110, or 115? Different manufacturers would probably use different ratings.

Most manufacturers use discharge times between 1 and 5 hours for their ratings. For example, one manufacturer might rate his 450mA hour AA cell as being good for 450mA for one hour; another manufacturer might make a slightly weaker cell which will only deliver 450mA for 50 minutes; but since it might deliver 90mA for five hours, he too would call his cell a 450mA hour cell. It all depends on how you measure it.

Another question is, "When do you define the cell as discharged?" This brings us back to that 1.0 or 1.1V level. A manufacturer who uses 1.1V as his cutoff in figuring his ampere-hour rating might be able to squeeze a little more out of his cell if he let it go down to 1V; hence he is giving you more than the guy who uses 1V in the first place.

Discharge Current

In order to compare different size cells with each other in terms of current flow, we use something called "C rate." The C rate is a charge or discharge current equal to the milliampere-hour or ampere-hour rating of the battery. For example, for that 450mA Hour AA cell, the C rate current is equal to

450mA. The C rate current for a 1.2A Hour D cell is 1.2A, and so on. Then a cell that is discharged at its C rate will last about 1 hour before reaching its discharged state, assuming that the manufacturer used the 1 hour discharge rate in figuring his cell rating. If the manufacturer uses, say, the 5 hour rate, then he is basically using a C/5 (or 0.2C) rate for five hours of discharging. In the case of the 450mA Hour AA cell, that translates into 90mA (450/5 is 90, or .2 of 450 is 90, so the C/5 and 0.2C notations are identical) for a period of 5 hours.

Then the amp-hour or mA-hour rating is approximately equal to the C rate at which we discharge the battery times the number of hours that the battery will last before going discharged.

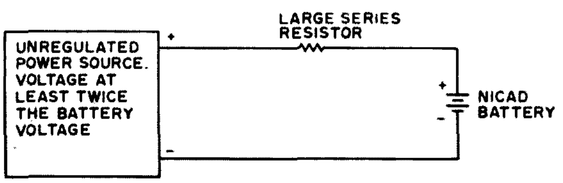


Fig. 2. Simple Nicad battery charging circuit.

But we have to be somewhat careful when we start talking in terms of batteries rather than just single cells. A battery is a number of cells connected in series with the intention of increasing the voltage. But since in a series circuit the current is the same throughout, then if we draw a current of, say, 100mA from the battery, the current through each cell is also 100mA. In other words, each cell in the battery is being discharged at the same speed. Therefore we should make sure that all the cells in series are of the same size and type.

But even then, some of the cells may be better than others. That means that the weaker cells will reach their discharged state earlier than the stronger cells, since all of them are conducting the same current. Therefore, eventually the weakest cell will reach 0V. If we were to disconnect the load at this time, the cell voltage would eventually drift back to .5 or more, and no harm would be done. But if we continue to draw current from the battery, this weak cell will slowly start being charged by the stronger cells – but in the opposite direction from its normal polarity. If this occurs for only a short time, the weak cell voltage will only go negative by a few tenths of a volt, and no harm will be done. But continue to do it for a longer time, and the cell voltage becomes strongly negative; at this time the chemical reaction in the cell changes, some heat and gas is produced, the cell vents to the outside, and in general becomes ruined. Do this long enough, and some of the other weaker cells go the same route, and you wind up with a battery which has some good cells and some bad ones.

The moral of the story is that a single cell will not be substantially harmed as long as it is discharged slowly enough to prevent excess gas pressure from forming inside, even if it is discharged down to zero. But a multicell battery can have some of its cells seriously damaged even though its total voltage may still be enough to operate the equipment it is connected to. Hence, if you build, say, a 12V battery out of 10 AA cells, you cannot really hope to get all 450mA hours of use out of it all the time; to be sure of not killing the battery you should stop discharging in plenty of time to avoid exceeding the weakest cell.

The problem is not as bad with a collection of separate cells as with a sealed battery where you cannot replace a cell at a time. But even with separate cells it is not a good idea to replace one cell at a time, because having a few good, new cells in the battery just increases the chance that someday they will kill the weaker ones. But there is a trick that some people have used for some time with supposedly good results: In a multi-cell battery, put a silicon power diode (whose continuous current rating is at least equal to the maximum load current you will draw) across each cell, *reverse-biased* (i.e., cathode goes to the positive terminal of the cell, anode to the negative). In normal operation, each diode is reverse-biased, and so draws no current. But if one of the cells starts being reverse-charged by the rest of the cells, the diode now keeps the reverse voltage across that weak cell from going above about 0.7V, the forward drop across the diode. This not only keeps each cell from being deeply reverse charged, but also provides a current path for the current through the battery. Hence as you start getting close to the end

of the battery charge, and one cell after another slowly goes to zero and then to a reverse voltage, the total battery voltage will slowly decay towards zero, rather than take a sudden dive. You at least get some warning before everything goes dead.

While discharging cells, by the way, beware of short circuits across cells. Nicads have a much lower internal resistance than even dry cells – on the order of a fraction of an ohm. That means that an accidental short circuit may easily draw currents on the order of 10, 20, even 50 amperes, from relatively small batteries. In other words, it is easily possible to get discharge rates of 10C, 20C and more. There will, of course, be a lot of battery heating, which in general is not good for battery life.

Temperature Ranges

A Nicad can be stored in a wide temperature range, from -40°F to +122°F, almost indefinitely. Though it may eventually self-discharge through leakage, it can be recharged again with no harm. During discharging, however, the internal resistance rises at low temperatures and so the battery becomes less efficient below about -4°F, though it can be discharged below that temperature as long as the discharge current is low. At the high end it can be safely discharged at temperatures as high as 104°F, though at higher discharge rates there may be enough internal heating to increase the internal temperature above that point, in which case damage might occur.

But the most restrictive is the temperature during charging. As we will see in a moment, charging the battery produces gas; there is an internal chemical reaction which is supposed to absorb that gas, but this reaction does not work well at low temperatures. Hence charging should not be done below about 41°F, nor should the temperature get above 104°F. However, keep in mind that these higher temperatures have other side effects – cells discharge faster at the higher temperatures, and charging is not as efficient, this means it takes longer to charge to a given level at higher temperatures, and in fact it may not be possible to charge the battery to its full capacity at all.

The message is that room temperature is best for Nicads. Try to avoid very high or very low temperatures, and especially stay away from low temperatures during charging.

Charging Nicads

Here we finally get to the important stuff everyone wants to know. Why do some Nicads require charging for 14 to 16 hours, while others can be charged in 3 hours or less? Here's the scoop.

First of all, to charge a Nicad you always have to put more in than you get back out, usually about 50% more. For example, to charge a 1A hour cell you have to put into it 1.5A hours; to charge a 450mA hour AA cell you have to put in about 675mA hours. Thus the normal method of charging a 450mA hour AA cell is to charge at 45mA for 14 to 16 hours, which works out at somewhere near 675mA hours. For that battery, 45mA works out as 0.1C; most Nicad manufacturers say that the best way of charging their cells is at 0.1C for 14-16 hours, which works out to somewhere between 1.4 and 1.6 times their normal discharge capacity. Another way of looking at this is that about 2/3 of the charge you pump into the cell is stored for later use, while the remaining 1/3 is wasted, usually in the form of heat.

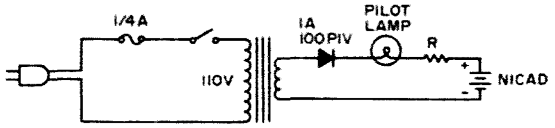


Fig. 3. Actual charger for Nicad batteries.

But charging at 0.1C for roughly 15 hours is not the *only* way to charge that cell. Remembering the total amount of charge you have to put into the cell, *IF YOU ARE CAREFUL AND KNOW EXACTLY WHAT YOU ARE DOING* you might be able to charge at half that rate for twice as long, or perhaps twice that rate for half as long, etc. Thus a C rate charge for 1½ hours, or 0.5C rate for 3 hours, or a 0.05C rate for 30 hours, all put the same charge back into the battery. But before you jump to conclusions and run off to build your new INSTA-CHARGER, read on. Let's go back to look at that 1/3 of the charge that gets wasted.

As you charge the cell, about 2/3 of the charge you are putting in is spent doing useful work – in a chemical reaction which results in energy being stored in the cell. The other 1/3 is wasted in useless side reactions, such as generating oxygen gas at the positive plate. The positive plate, however, is also supposed to be oxidizing one of the active chemicals at the same time, and this oxygen gas generation is competing for the available oxygen with the oxidizing process. At normal charge rates there's enough oxygen in the solution for both processes, and so no harm is done, since the amount of gas produced is very small. But at very low charge rates (0.01C or less) there simply isn't enough energy being poured in for both, and the gas generation wins out. Hence most of the "charging" really isn't doing any charging at all; it's just pushing some atoms back and forth in the solution. Thus charge rates below about 0.01C are useless; that 450mA hour AA cell would not soak up much charge at a current of 4.5mA (0.01C) for 150 hours.

Now, what happens to all that oxygen gas? Fortunately, the gas slowly finds its way to the negative plate where it slowly undergoes another chemical reaction and is converted back into useful stuff. During this conversion some heat is also generated at the negative plate. In this way the excess charge put into the cell is simply wasted as heat. This is lucky, since otherwise the gas pressure inside would build up to the point where the safety vent would have to open to prevent an explosion.

But if you generate oxygen gas too fast it won't move over to the negative plate and be absorbed fast enough, and the pressure will build up fast. In an effort to combat this problem, it is possible to make the negative plate larger than normal, which helps to reduce this danger but wastes space. Now we are ready to take a look at what happens when you charge a Nicad faster than the recommended 14-16 hours.

The faster you charge, the more oxygen you generate. As long as the battery isn't fully charged, though, the amount of oxygen isn't too large. Since the negative plate is usually a little oversize anyway, you can take advantage of this safety factor. I have charged small AA cells (450mA hours) at 0.5C and even 1C rates for five or ten minutes when they had discharged completely, and I wanted to get my 2m FM H-T back on the air fast. *BUT YOU MUST NOT OVERCHARGE!!!* I did it only when I knew the battery was completely discharged, and even then I was careful not to do it too long. It is probably safe to use a 1C rate on a *completely discharged* battery for perhaps a half an hour or three-quarters of an hour, but anything beyond that is foolhardy. (By making the negative plate really large, it is possible to absorb the oxygen gas extremely fast. Batteries with charge rates as high as 20C (five minutes for a complete charge) have been built. But a normal cell will be damaged by anything above 1C rate.)

Once again, YOU MUST NOT OVERCHARGE at these higher charge rates. Remember, while you are still charging a battery that is not quite up to full charge, 1/3 of the charge you pour in is spent generating oxygen gas and heat. Once the battery is fully charged, almost *all* the charge current is spent generating gas and heat. The pressure and temperature can rise very fast. At a C rate charge the pressure can go up at a rate of over 3 psig per minute, with the temperature rising at almost 10°F per minute. It takes just a few minutes to double the pressure and get really hot inside. These factors, combined with the fact that at fast charge rates (1C and better) the charging becomes more efficient (you need only overcharge by 20%, rather than by 50% as at lower charge rates), which means that you can get to the fully charged state faster than you expect and really do a lot of damage in a very short time.

This is why most manufacturers specify a charge rate of 0.1C for their cells. These cells are designed to allow overcharging at a 0.1C rate almost forever. The negative plate is big enough to absorb the gas and the temperature does not rise high enough to do damage. Hence a 0.1C rate charger is safe, since if you forget to remove the battery after 14 to 16 hours, you will still not damage the cell even though you are overcharging it.

But as soon as you go above a 0.1C charge rate YOU MUST NOT OVERCHARGE. There are only two safe ways of

fast charging a cell – either knowing ahead of time exactly how much charge there is remaining and then carefully timing your charging to make sure you don't exceed the fully charged state, or else building some sort of over-charge detector.

There is no simple way of telling how much charge is remaining in a cell; the only time you can be reasonably sure is if you know that the cell is completely discharged. But even then, beware – in a multi-cell battery you might think the battery is discharged when in fact some of the cells are still right up there. Fast charge this battery, and one or more cells (the good ones) will be overcharged before you know it. This is why I limited my 1C and 0.5C rate charges of my H-T batteries to five or ten minutes. I couldn't be sure of the state of the individual cells, since they are sealed inside the battery and I can't check them individually.

Similarly, there is no simple way of building an over-charge detector. Unlike an automobile lead-acid battery whose voltage rises at the end of charge, the Nicad cell voltage does not rise enough at the end of charge to be a sure .fire indicator. Cell voltage during charging depends on many factors, including cell temperature. The voltage would go up slightly during charging, except that as the temperature goes up this makes the voltage go down again. In other words, a voltage detector is not a safe way to avoid overcharging.

The only safe way of checking overcharging is to monitor either cell pressure or cell temperature. Pressure is the better method, but that requires putting some sort of strain gauge or other pressure detector into the cell, sealing it, etc., which makes it impossible to add it afterward. It is strictly a factory operation. Moreover, monitoring just one cell in a battery is not safe unless you carefully grade the cells ahead of time and put only matched cells into the battery. All of these make the pressure-type over-charge detection batteries expensive.

By far the most common method of over-charge detection is a temperature sensor such as a bimetal strip or thermocouple, mounted inside the battery in contact with one or more cells. Since the detector is not actually inside a cell there are no problems of leakage and sealing. The fast-charger is then built to charge at a high rate until the temperature starts to rise, or reaches some maximum value, at which time the charger either turns itself off, or more likely sets itself to a lower charge rate. This low charge rate, called a trickle charge, is often used to keep the battery from discharging if left in the charger for a long time afterward. In cheaper systems, the temperature detector, being not as accurate, turns off the fast charge before charging is actually completed, and then the charger reverts to a 0.1C rate to complete the process.

In any case, you might be able to add such a temperature detector to a single cell, but adding it to a multi-cell battery might be difficult. You might also have some trouble calibrating the system, as the type of case has a lot to do with how high the temperature gets inside. In short, it is not really practical to build a fast-charger for an ordinary Nicad, that being a job best left to the factory.

The various charge rates are usually classified as follows:

Trickle charge – 0.01C through 0.03C

Normal ("overnight") charge – 0.05C through 0.1C

Quick or rapid charge – 0.2C through 0.5C

Fast charge – 1C and up

The trickle and overnight chargers are usually very simple, consisting of just a few parts. Fast chargers are complicated since they have over-charge detectors. Quick or rapid chargers can be either, since it is possible to build a Nicad so it can continuously withstand overcharge rates as high as 0.2C or 0.3C, so a simple charger can be used.

Simple Nicad Charging Circuit

In all of the methods discussed above, it is important to control the charge current. Nicad chargers are generally constant current chargers, where the circuitry is chosen so that the charging current is relatively constant regardless of the condition of the Nicad. This is quite different from the

ordinary lead-acid charger which is more of a constant voltage charger.

The difference in methods is important because it limits your choice of charging circuits. In a lead-acid battery, the battery voltage gradually rises as you charge the battery, starting at somewhere below 12V (for an ordinary auto battery) when the battery is only slightly charged, and finally reaching about 13.8V or so when the battery is fully charged. Hence the circuit of Fig. 1, would be a fairly good 10A charger for a car battery. When the battery voltage is slightly under 12V, the voltage across the 0.2Ω resistor is about 2V, and so the current is 10A. As the battery charges its voltage goes up, so that the voltage drop across the 0.2Ω resistor drops, and therefore the current drops. Eventually, the charge current slowly drops to zero as the battery voltage approaches 13.8V. (Of course, a well-regulated 13.8V source capable of delivering 10A is expensive, so this is not a practical circuit, but it would work.) The only reason it works, though, is that the lead-acid battery voltage is pretty well defined, and keeps going up as the battery becomes more charged.

The trouble with the circuit is that the charging current depends greatly on the difference between the regulated voltage and the battery voltage; if for any reason the battery voltage should drop, the current would go up. But this is exactly what happens in a Nicad. When the Nicad becomes fully charged, it starts heating up. This heat makes the battery voltage drop. In a constant voltage charger, this would increase the charge current further, leading to more heating. More heating leads to more current, and first thing you have is thermal runaway!

For this reason you need a circuit whose charge current is independent of the battery voltage. You *could* use some sort of a current regulator, but the easiest way is to start with a power source whose voltage is at least twice the Nicad battery voltage and then drop the excess voltage in a large series resistor. The larger the initial source voltage in relation to the battery voltage, the more the current stays constant (for example, Motorola chargers for their H-T batteries start with over 100V to charge a 15V battery). The resulting circuit is similar to Fig. 2. By the way, this explains why you cannot safely charge a 12V Nicad from the 12V car battery.

To give you an example of an actual charging circuit similar to Fig. 2, I will describe a charger I use for a 12V battery made up of ten 450mA hour AA cells in series. I use a 0.1C charge rate of 45mA, using a small adjustable dc power supply as my power source. I use a 330Ω 1W resistor in series with the battery. At the specified charge current of 45mA, the voltage drop across the 330Ω resistor is 15V; I therefore adjust the power supply to provide 27V output (15 plus 12). The power supply has a voltage meter and an adjustment pot, but no current meter; however, no current measurement is really needed with this system, as the current is automatically set by the series resistor.

The voltage source for charging Nicads need not be pure dc, but can also be rectified unfiltered dc from either a half-wave or full-wave rectifier. Since most small Nicads of the type used in amateur portable gear require small charging currents half-wave rectifiers with no filtering are perfectly suitable. Fig. 3 shows a typical charger circuit operating from rectified ac.

In order to show how to design this circuit, let's pick a typical case. Suppose you want to charge a 6V battery consisting of five 1.2A hour D cells in series. The capacity of this battery is 1.2A hours, and so the 0.1C charge rate will be 120mA.

First we pick a suitable transformer. We need one that will provide at least twice the voltage of the battery. A 12.6V transformer looks at first glance as though it might work, but if you look up the average voltage of a half-wave rectified sine-wave in a textbook, you discover that it is only about 45% of the rms value (actually, it is about 32% of the peak value, which works out to the same thing). Hence the average voltage of the rectified sine-wave will be only about 6V – hardly twice the battery voltage of 5V. So let's pick a larger transformer – how about a 24V 1A transformer? (Of course, a 500V transformer would work real well in a constant current supply, but heaven help

you if you accidentally touch the charger output leads while no battery is connected to it. Keep the transformer voltage reasonable.)

Now pick a suitable pilot lamp. We want a lamp which will light dimly at the charge current, and whose voltage rating is less than the amount we need to drop between the transformer output and the battery. The lamp actually serves several functions. If we should accidentally short the charger output leads, the lamp will light brightly to warn us and will perhaps act as a fuse as well. Second, it lights only if the battery is properly connected. If there is a bad connection, the lamp will not light and if we connect the battery backward, the lamp will light very brightly. Finally, if the battery is open or shorted, the lamp will tell us that too. In this case a 47 bulb may be a good choice since it is rated at 6.3V and 150mA. It should light quite well at 120mA, and will drop about 6V in the process.

Finally we need to select a value for R which will drop the rest of the excess voltage. Calculating its value is not easy, since the charging current flows in short bursts and also, the lamp resistance is not constant. Hence, the best way is trying different values until we get one that produces the right current. We want to start with higher resistances than required and work downward so as to avoid real large currents. As a first approximation we just assume that the transformer is providing 24V (which gives us a good safety factor), of which we drop 6V in the lamp and 5V in the battery, leaving 13V for the resistor. Ohm's law then says that R should be 108Ω as a starting value. Merely experiment with various resistors (using a series milliammeter) until you get one that provides the right amount of current. Once you get the right value you can put in a switch and a second resistor of a larger value which will provide a 0.01C rate for trickle charging. In each case, use the equation $P=I^2R$ to check the power dissipated in the resistor and make sure to use one with a high enough power rating.

One last comment and warning: The charger circuit here will work for single cells, and will work also for multi-cell batteries *as long as* all cells in the battery are connected in *series*, are of the same *capacity rating* and are all in roughly the *same discharged condition.* You *cannot* charge dissimilar cells in series, cannot charge new and old cells in series and cannot charge cells in parallel. If you want to charge several different cells at the same time, you can share the same transformer and rectifier among them, but each cell must have its own pilot light and series dropping resistor.

Reconditioning a Nicad Cell

As mentioned earlier, deeply discharging a Nicad cell, even down to zero volts, will not really harm it as long as it is not done at an excessive current load. (This is not true of multi-cell batteries, since the weaker cells will then be reverse-charged and seriously damaged). In fact, an occasional deep discharge may even be good for a Nicad under some conditions.

This is because a Nicad cell has a sort of "memory." If you repetitively use it in a certain way, day after day, the Nicad starts to remember that and acts accordingly. Specifically, it works like this. Suppose you have a Nicad whose capacity is such that you can power a monitor receiver from it for 10 hours per charge. But you get into the habit of using the receiver only 4 hours a day and then charge the battery for eight hours each night at 0.1C. After a while the Nicad starts to behave as though it only has enough capacity for four hours of operation. This is because only 40% of its capacity is used each day, with the remaining 60% of its chemicals lying idle. If one day you needed it for five hours of use, you would find that the battery dies after 4 hours.

To destroy this "memory" and bring the cell back to its full capacity, you simply deeply discharge it down to zero volts one or two times (slowly – don't exceed a rate of 0.5C or so, to avoid excessive heating), followed by a full charge at 0.1C each time.

A similar operation would work for multi-cell batteries, except that you must discharge each cell separately to prevent reverse-charging the weaker cells. This is easy if you have a multi-cell battery made up of separate AA cells or some other standard cells; but it is difficult to do for sealed batteries. I have used a reconditioning jig

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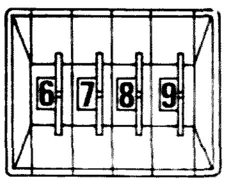

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made up of 10 AA-size cell holders, with a 2V bulb soldered to each holder. I simply insert a cell into each holder and discharge until the lamp goes completely out. Following the complete discharge of all cells, I recharge them for 15 hours at 0.1C (which can be done in series from one charger).

As mentioned above, only repetitive use of a Nicad will cause this memory effect. Most amateur applications will have enough of a day-to-day variety that this memory effect will not show up.

Final Comments

The above information applies to Nicad cells only, not to the newer rechargeable alkaline cells. The alkaline cells are much more critical and may be very easily damaged. In general, do not allow rechargeable alkaline cells to completely discharge at any time. Charge them before they go completely dead, but be careful not to overcharge (Wow, that sure is hard!). They come charged when new, and should not be charged before use (unlike Nicads which usually require charging before their first use). Finally, the maximum allowable charge rate for the alkaline cells is 0.05C for approximately 30 hours – do not try to charge them any faster.

Further information on Nicads may be easily obtained in a $2.50 booklet entitled "Nickel-Cadmium Battery Applications," publication No. GET-3148, available from the Battery Products Section, General Electric Company, P.O. Box 114, Gainesville, FL 32601, as well as from similar applications books available from other Nicad manufacturers.

In addition to the electrical do's and don'ts above, be careful not to throw Nicads into a fire, don't solder to a cell, don't replace cells in a multi-cell battery unless you have the knowledge to properly match the replacement cell to the older cells and be very careful not to short a cell out by placing it on a metal surface or letting it touch metal tools, rings or coins. Due to the extremely low internal resistance short circuit currents can be very large and cause sparks and heat.

. . .K2OAW

Jeff Duntemann WB9MQY
7619 West Clarence Avenue
Chicago IL 60631

How To Get Zillions of Parts for Nothing

Ya gotta have a junkbox. I mean, there is nothing more embarrassing to a basement experimenter than beginning a new gizmo and discovering he hasn't a 47K, half-watt resistor to his name.

I found myself at just about that point not long ago. The League recommends politely wheeling and dealing local TV repair shops out of burned-out chassis for a dollar or two apiece. Value for value, they say; after all, the poor guys are out to make a buck.

So I spent an afternoon visiting local repair shops with a buck or two in my pocket and an innocent look on my face.

One man politely told me he didn't run that sort of shop; another said old chassis attract cockroaches. One guy *did* offer me a 1957 RCA chassis minus tubes, tuner, CRT and half of everything else – for five dollars. I said no thanks, went home, and began composing a thoughtful rebuttal to the League article.

Little sister WN9OVO wandered by. "No luck, huh?"

"Value for value," I kept mumbling. "This country oughta go on the junk chassis standard."

"Put an ad in the paper," she said. "Begging busted TVs from TV repairmen is like buying sand in the middle of the Sahara."

She had a point there.

The ad read: WANTED: BROKEN RADIOS, TVs, PHONOS, ANY JUNK ELECTRONICS NEEDED BY YOUNG RADIO AMATEUR FOR EXPERIMENTATION. I WILL HAUL AWAY. Call 763-1376 EVENINGS.

I placed it in a local supermarket-and-drugstore ad flyer with a circulation of perhaps two thousand middle class families within ten blocks or so. It cost me fifty cents, and I expected half a dozen old TV sets and maybe a clock radio or two to cannibalize.

Once again, I had underestimated middle-class America. By suppertime of the day the flyer hit the mailboxes I had eleven calls scrawled on the back of a pizza board tacked to the wall by the telephone. Lots of junk in the neighborhood, apparently. I thought it was funny. The next morning Little Sister and I borrowed my father's station wagon and began the rounds.

We put it all in the garage. There was no other place to put it. Every respondent, it seemed, had a black and white console TV set gathering dust in the basement which he was too old/lazy/busy to cart out in front on garbage day. Most were nice old ladies who approved of my conservative haircut and wondered what on earth I was going to do with all that junk.

Never use the word "ham" in channel 2 land. I had a little speech about preparing myself for a useful career in electronics through construction of small transmitters and receivers. They liked that, and marvelled that I wasn't out on the streets breaking windows like most college kids. And the calls just kept coming in.

They came in hot and heavy for almost a week. The garage was filling with alarming swiftness. The callers began to offer not one TV but two or three. (One pleasant old gentlement gave me five, adding that he couldn't see too well anymore and anyway, there was some (expletive deleted) radio ham down the street who always messed up the picture. He told me he was glad I was going to be a disk jockey.)

I began to lose track of some of the calls, forcing the callers to call back, asking if I had forgotten. One persistant woman called me five times until I emptied her basement of a TV and three grungy phonographs.

The calls occasionally got a little weird. One lady with a raspy voice asked if I wanted to buy two manglers for 25 dollars. I figured a mangler was a 300 watt CB linear or something, but had the curiosity to ask. A mangle (bless her heart) is a 200 pound rotary ironing machine that literally squishes the wrinkles out of things. Producing a lot of TVI too, no doubt. I told her I was broke and hung up before she could offer them to me for nothing. Another chap had five hundred three-transistor radios to sell in a hurry for a hundred bucks. He refused to give me his phone number and is probably still at large.

Contributions were not always broken. Two of the TVs worked excellently, and I donated them to apartment-hunting friends who enjoy the mind-rot machine. One sour fellow handed me a 40 watt tube-type stereo amp, and told me it had worked fine for years, but recently had begun blowing the house fuse every time he plugged it in. He thought I might be able to get a few parts out of it. I looked down at the line cord and noticed that the insulation had crumbled right where the cord entered the cabinet. The wire had been twisted, and. . .of course I could get a few parts out of it, thank you, sir. A little soldering-gun work and it's been pumping John Denver into my speakers beautifully ever since.

Another man gave me several working tuners and amps which were "just cluttering up the house." The only cost to me was half an hour spent complimenting the bass response of his new system. Value for value? You bet!

Perhaps the best deal of all came from a retired gentleman who led me to a basement corner and pulled a dusty bedsheet off an enormous 1937 Zenith all-band floor-standing receiver, complete with magic eye tuning indicator and flawless darkwood cabinet.

"Bet you'll have some fun ripping this ol' bugger apart," he said to me with a grin. I agreed and carted it home. Just for kicks I plugged it in behind the garage, expecting it to blow itself to kindling. Instead, with the antenna lead clipped to an aluminum ladder, I copied a VE7 on 20 meter CW, without a bfo. No trace of AC hum. And a tremendous bass response which is wasted on our gutless AM broadcasts.

A similar Zenith, needing only a filter capacitor, came to light about a week later. I have gotten fantastic offers for both of them from the antique radio freaks.

Nor were the giveaways limited to home entertainment devices. An elderly ham spent half an hour picking through his junkbox, filling eight boxes with 1625s, substitution manuals, ancient transmitting variables, relays and more than 200 pounds of power transformers, modulation transformers, and bathtub capacitors.

A second ham gave me an old but spunky Knight T-50 transmitter. A third sold me a mint-condition Central Electronics 10B exciter and 458 vfo for ten bucks, telling me to "get the heck off of CW." That was the only thing I paid a penny for.

It went on and on. I answered more than 50 calls, which continued drifting in for better than 5 weeks. Of those 50 I visited 36. The final box-score (kept with pain-staking accuracy by WN9OVO) turned up as follows: 31 broken TV sets, 2 working TV sets, 19 broken clock radios, table radios and transistor radios, 7 working clock radios, table radios and transistor radios, etc. 2 salvageable "antique" type radios, 3 unsalvageable "antique" type radios, 8 broken radios, 3 working amplifiers, 3 broken amplifiers.

Also, 4 working tuners, 1 broken tuner, 2 broken eight-track tape players, 4 broken intercom sets, 3 usable speaker cabinets with speakers, 1 working ham transmitter (not including the 10B), 1 broken photoflash

strobe unit, 1 broken oscilloscope, 1 working 650V power supply, several old Spike Jones records, about a dozen boxes of loose parts from a ham and a man whose son had once played with "that stuff."

It took about eight weeks (i.e., most of the summer) to reduce all that junk to its component parts. I have a fairly respectable junkbox now, although I admit I have a few more 6AL5s and 5U4s than I'll probably find use for. But I saved all the deflection yokes, pried the copper out of them, and got 23 bucks for the lot. Beats hoarding pennies any day.

We're still crunching resistors out in the garage, and I suspect that the mice in the foundation have nests woven of greasy hook-up wire gorged by the pound from the bowels of yesteryear's boob tubes. My mother took a call on the ad as recently as Labor Day. She told the nice man I was out of town, and warned me that if I so much as thought about doing it again, I had better be out of town – if I value my skin.

So, you poverty-stricken squawkbox-builders out there, I would recommend ignoring the League's suggestion to con TV repairmen out of totally blitzoed chassis for "a dollar or two."

Why buy sand in the middle of the Sahara? All the world's a junkbox, OM!

Dig in!

WB9MQY

Radio Waves Frighten Thousands

Guglielmo Marconi needed police protection from people who threatened to kill him because they thought his radio waves were harmful. Frightened people complained that the radio signals were passing through their bodies and making it impossible for them to sleep. A wealthy woman charged that the waves made her feet itch. A German man publicly made plans to go to England and shoot Marconi but he was turned back by British authorities.

The hostility toward the inventor came after years of being ignored. In 1894, the 20 year old electronic pioneer coaxed his crude equipment to send a signal a few feet across his room. Next year his signals spanned the length of his father's home in Bologna, Italy. When Marconi patriotically offered his invention to the Minister of Posts and Telegraphs, he was snubbed.

Marconi packed up his equipment, and with his Irish mother, sailed to England. Surely, he thought, the world's greatest maritime power could use ship-to-shore communications. British customs officials ignored his frantic efforts to explain that his radio was not a bomb. The delicate instrument was damaged by their forcing it open.

The following year a family friend helped him gain the attention of the British Postal authorities and he demonstrated that he could send a signal from the General Post Office to a nearby building. The press and public showed no interest in the feat.

Marconi then constructed a bamboo tower that thrust his transmitter 90 feet into the air and sent his wireless signals nearly two miles. He had built something too big to be ignored and the press took notice. Years later, he sadly observed, "The calm life is over."

The publicity aroused fears in a previously indifferent public about the possible harmful effects of radio waves. A flood of crank mail – some containing threats on his life – came pouring in. Guarded by police, Marconi moved his operation to Wales in 1897. Soon he was transmitting signals out 25 miles, then to 150, and in 1901 had spanned the Atlantic with his wireless signals.

It was more than two years after this that the public outcry diminshed enough for Scotland Yard to withdraw the police guards protecting the man who developed radio for the world.

Reprinted from the Two Rivers ARC (Pennsylvania) "Spark Gap" – via W6SD CARRIER.

Karl Ditsch DK8SQ
D-7336 Uhingen 5
Teckstrabe 16

C31 or Bust!

The call Charlie thirty-one ("PX" up to 1969) is no longer a real DX-rarity. The small princedom, situated high up in the Pyrenee Mountains between France and Spain, is not hard to reach now from France, thanks to a new road. European DX-peditions often go there for a few days. There is no difficulty in obtaining a license from the Perpignan PTT. However, there is still a certain demand for this call on the air, especially in CW, as the recent expedition of amateurs from Goppingen, South Germany, has shown.

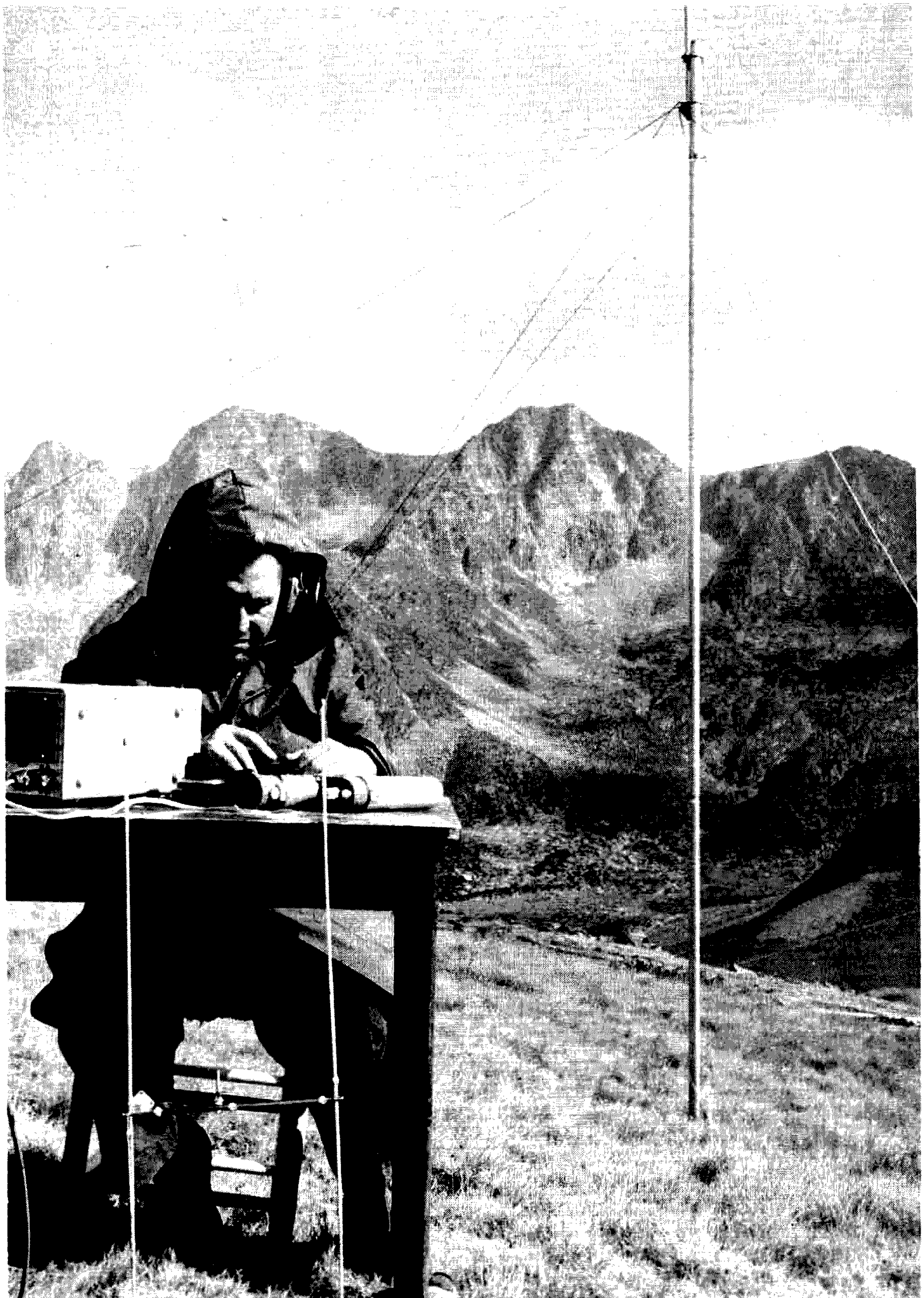
With DJ9NA on CW and DK8SQ on SSB, the amateurs were busy in the first week of September under the calls C31HF (CW) and C31GM (SSB). More than 1200 QSOs on CW and 186 on SSB were made, many of them with U.S. stations.

The amateur stations were established on the "Col d' Envallira," at an elevation of 2500 meters (around 8000 feet). The location was about one mile away from the commercial "Sud-Radio" station, operating on 370 meters with 900 kilowatts AM output, so there was some difficulty on the receivers with copying at these QRM levels. In some transmissions, the OM on the other side of the ocean asked me to turn my radio in the shack down, because it was too loud. But there was no radio playing in my "Voltz" which served as a shack, it was hf picked up from Sud-Radio in the transmitter, and carried along.

On September 5, around 22 GMT, I had the good luck to hear W2NSD putting forth on one of his pet subjects, Oceanus. He took me up and left me the frequency after a short QSO. Now it seems that just about everybody in the U S. had been listening in to Wayne, because I had a beautiful pile-up immediately following his signing "off and clear." Thirty-nine QSO's with W's and K's were possible inside an hour, before the band closed down around midnight local.

No special difficulties were encountered on the technical side. The 220 V generator supplied both transceivers, and so there was some interference when both stations were operating simultaneously. For future expeditions to this QTH I would recommend taking a heavy sledge hammer for setting up the antennas, and also a pair of gloves – touching a wire there with naked hands becomes a problem. The 900 K AM from the nearby transmitter cause sparks up to an inch in length when making connections – or via the fingertips.

There are only three Andorran OM's licensed in the call-book, and the help of C31AH, employed at Sud-Radio, was much appreciated by our group. Next spring, we hope to be able to go there again, for an even better repeat performance. . . .DK8SQ



Lothar Leberecht sits huddled at his station high in the Pyrenee Mountains during a recent expedition of amateurs from Goeppingen.

H.C. Sherrod W5ZG
4715 Crockett Blvd.
Galveston TX 77550

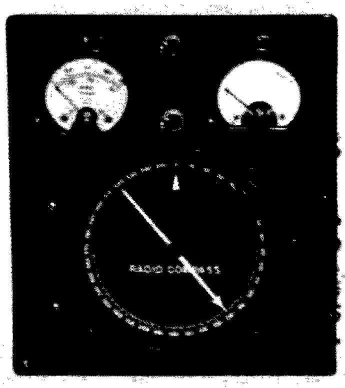


Fig. 1.

Wind Indicator for Your Shack

At those amateur radio stations located on or adjacent to the seacoast, it is advantageous to know the wind velocity and wind direction. During the hurricane season the information provided by wind velocity and wind direction indicators is certainly helpful and, if such information can be obtained from a number of locations in the affected area and co-related, a good estimate of the approximate location of the disturbance can be made. However, few amateur radio stations have these facilities and one of the reasons for this is the cost of the instruments.

The subsequent description of the wind velocity and wind direction indicators constructed and installed delineates a reliable and effective facility that can be constructed for approximately $35.

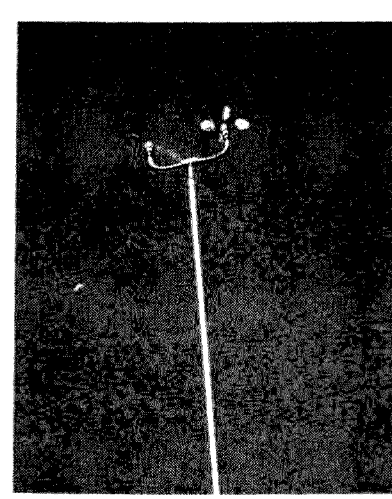
After some preliminary investigation, it appeared that the two major problems involved were: The method of sensing wind velocity and wind direction; and the manner of housing the sensing instruments to protect them from the weather.

For sensing the wind direction, the use of a selsyn transmitter connected to a selsyn indicator appeared to be the obvious answer.

From further consideration, it appeared that the employment of a selsyn as a velocity transmitter was possible. In this application, if the single phase winding of the selsyn is energized by a constant direct current, the three phase windings would deliver a three phase alternating voltage directly proportional to the speed of rotation of the selsyn shaft. Preliminary experiments revealed that within the range of dc currents the single phase winding could tolerate, the three phase ac voltage delivered was inadequate throughout the estimated operating speed range. Further experiments, however, revealed that employment of a three phase step-up transformer bank would overcome this objection and, after rectification of the ac voltage, the filtered dc voltage could be effectively applied to an indicator.

Housing the wind velocity and wind direction selsyn transmitters in such a way as to not impede their movement by the wind and at the same time to completely protect

Fig. 2.



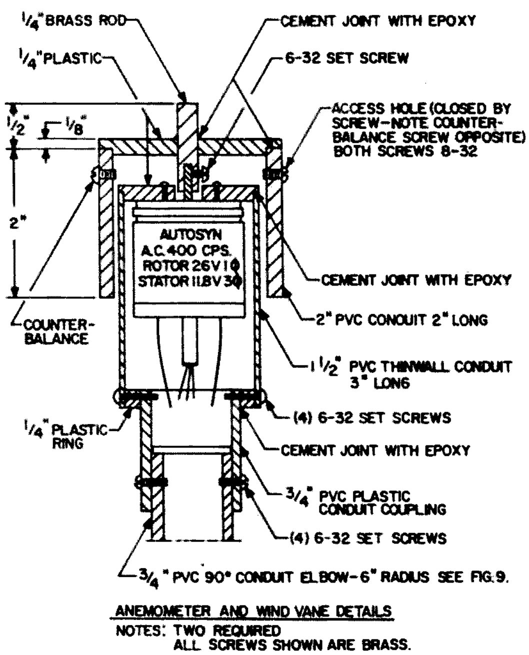


Fig. 3.

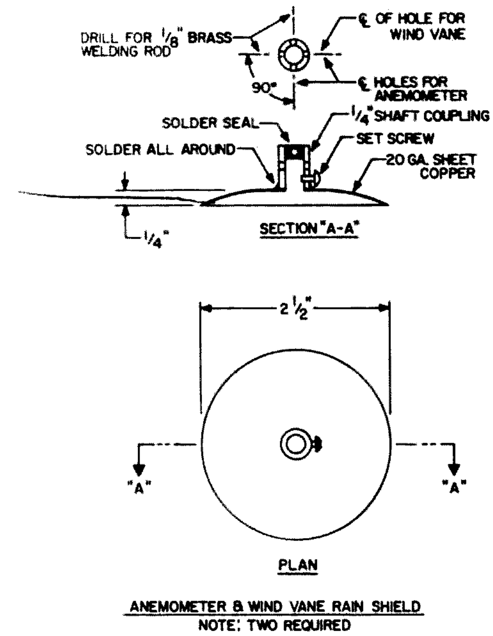


Fig. 4.

them from the weather was solved very effectively by the fabrication of plastic housings made from plexiglass sheet and polyvinyl chloride (PVC) electrical conduit. PVC conduit is impervious to sunlight, rain, and corrosion and this material can be fabricated with simple tools. The two housings subsequently described were fabricated with a hacksaw, drill press, and a bar cutter. While a lathe would have made a better job possible, one was not available.

The basic components of the system are the indicator cabinet shown in Fig. 1 and the wind velocity and wind direction sensors on their mast as shown by Fig. 2. The sensors are subsequently referred to as the anemometer and the wind vane.

Anemometer and Wind Vane Details

The anemometer and wind vane sensors are identical with one exception, which will be described.

The selsyns employed are 400 cycle "autosyns" having a 26 volt single phase rotor and an 11.8 volt three phase stator. These selsyns are 1-9/16" long x 1-1/2" in diameter and are readily available on the surplus market at about $3.95 per pair.

A cross section through the sensor housings is shown by Fig. 3. The location of the "autosyn," the general arrangement, and the construction details of the housings should be readily apparent. As in all subsequent descriptions, a detailed description of fabrication and assembly is omitted in the interest of brevity. Two such units are necessary and each will require a rain shield as shown in Fig. 4.

The two sensors are identical with the exception of drilling the shaft coupling shown in Fig. 4. For the wind vane, only one hole is drilled in the shaft coupling to pass 1/8" welding rod. For the anemometer two holes, 90° apart, are drilled in the shaft coupling to pass 1/8" welding rod.

Figure 5 shows details and dimensions of the wind vane. In fabricating, the 20 gauge sheet copper wind vane should first be soldered to the 1/8" welding rod. After passing the rod through the hole drilled in the shaft coupling on the rain shield, the rod should be inserted in a hole drilled in the fishing sinker and soldered in place. By supporting the shaft coupling and sliding the vane rod, a point can be found where the weight of the fishing sinker pointer balances the weight of the copper vane. At this point, solder the rod to the shaft coupling.

The details of the anemometer cups are shown in Figs. 6 and 7. The anemometer cups are white plastic; cup dimensions shown in Fig. 6 are furnished to facilitate identification. These cups were obtained at the local dime store. Their resistance to weathering and deterioration is notable.

The mounting details and dimensions of

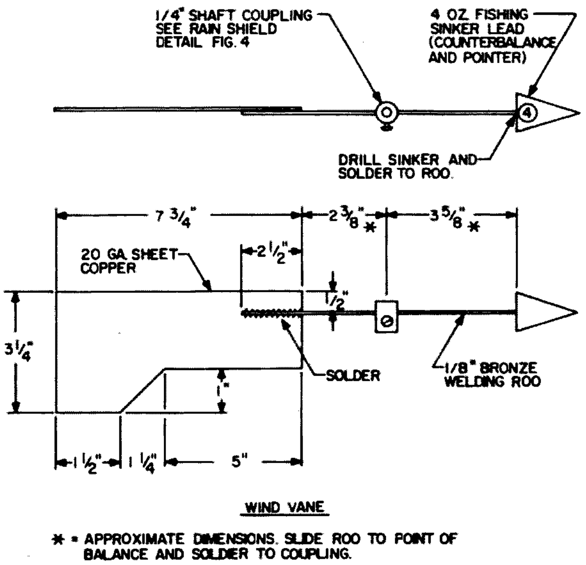


Fig. 5.

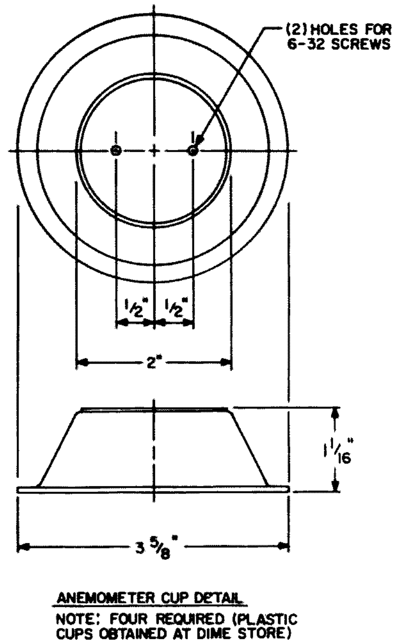


Fig. 6.

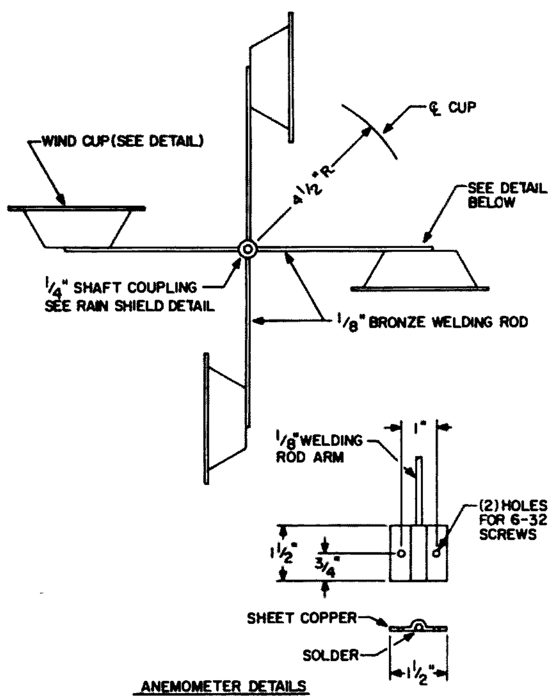


Fig. 7.

the anemometer cups is shown in Fig. 7. After constructing to dimensions shown, balance the whole by adding or subtracting the number of brass washers under the heads of the 6/32 bolts that attach the cups to the arms.

The anemometer and wind vane are connected to the indicator cabinet by a ten wire cable and the connections of this cable are shown in Fig. 8. Terminals 15 and 16 are bridged within the plug connecting the cable to the indicator cabinet. This arrangement breaks the 110 volt ac supply when the plug is removed from its socket.

Figure 9 shows the assembly details of the anemometer and wind vane.

Indicator Cabinet

Figure 1 shows the exterior details of the indicator cabinet. Figure 10 shows the diagram of connections. The wind direction indicator is a surplus 1-82 radio compass. In order to permit placing the radio compass in the cabinet, it is necessary to remove and disconnect the socket on the rear of the instrument and remove the sheet metal cover over the selsyn proper. In Fig. 1 the wind direction indicator is the large indicator at the lower center of the panel. The wind velocity indicator is a Weston Model 506, 0–100 mA dc meter. It has an internal resistance of 1000Ω and has a new scale showing miles per hour in accordance with calibration data shown in Fig. 11. The wind velocity indicator is located on the panel to the upper left. At the upper right of the panel is the milliammeter indicating the dc field current to the wind velocity transmitter. This instrument would best be a 0–200 mA dc instrument. As none was available, a 0–50 mA meter was shunted with a five times scale multiplier. This instrument serves two purposes. One is to indicate that the field current is 100 mA as the velocity calibration is based on this amount of field current. The other purpose is to show that

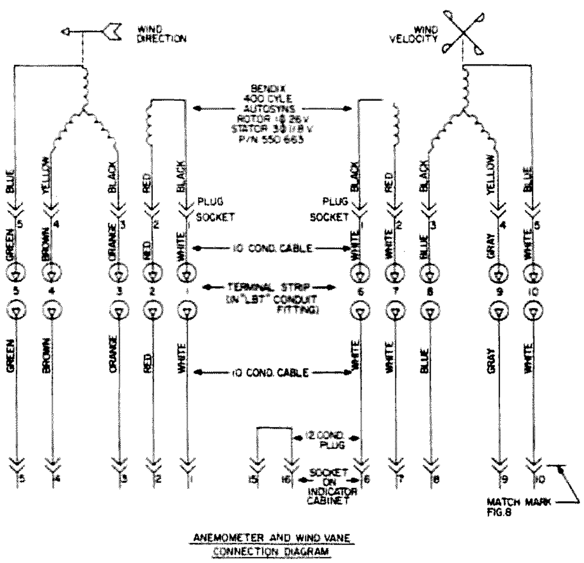


Fig. 8. Anemometer and wind vane connection diagram.

the selsyn field is energized. In Fig. 1 the switch at the upper center is S2 which controls application of ac power to the cabinet components. The switch below S2, S1, selects the low or high scale for wind velocity indication. The socket for the cable plug and a fuseholder containing a 1A fuse are on the rear of the indicator cabinet which is of moulded black bakelite. The cabinet is 3" deep x 8-3/8" high x 7-3/8" wide. This cabinet has a blank bakelite panel drilled for mounting screws.

Arrangement of components within the indicator cabinet is left to the individual. All components shown in Fig. 10 can be placed within the cabinet shown, but it does "take a bit of doing." You might want a larger cabinet.

As can be seen in Fig. 10, four 6.3 volt to

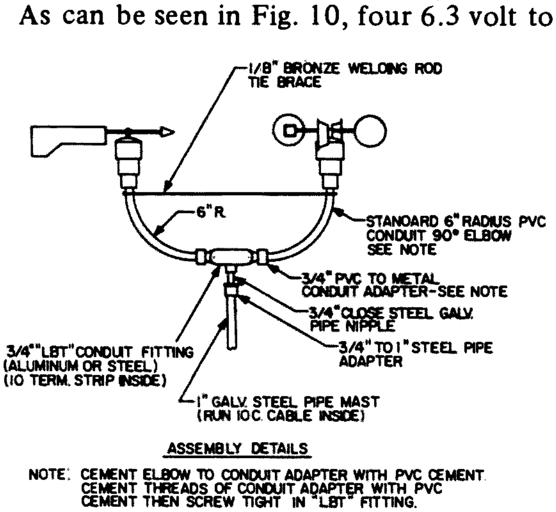


Fig. 9.

110 volt (at .6A) midget filament transformers are employed. One of these transformers supplies 6.3 volts ac to the wind direction transmitter and indicator. The secondary of this transformer is also connected to a bridge rectifier which supplied, through a filter, four dc volts to the field of the wind velocity transmitter. The 50Ω rheostat is employed to adjust the dc field current of the velocity transmitter to 100 mA; the value required by calibration. It may be noted that the filter system consists of four 100 μF 35V condensers and a choke which is the primary of a midget 500/4Ω output transformer. The remaining three filament transformers, connected delta-wye, step up the voltage from the wind velocity generator and deliver this voltage to six 1N34 diode rectifiers. The dc voltage from the diode rectifiers is filtered and delivered to the 0–100 μA meter. The arrangement of the wind velocity indicator, the 500 and 666.67Ω resistors and switch S1 is such that the load on the wind velocity generator is the same for both positions of switch S1.

Anemometer Calibration

If all of the following requirements are met, the calibration data shown in Fig. 11 may be employed in making a new scale for the 0–100 microammeter:

a. The wind cups conform with details, dimensions, and arrangement shown by Figs. 6 and 7.

b. The same type of selsyn ("autosyn") is employed for the wind velocity transmitter.

c. The field (single phase winding) current of the wind velocity transmitter is 100 mA dc.

d. The connection diagram and all values shown in Fig. 10 for the wind velocity indicator are duplicated.

e. Details shown by Figs. 6 and 7 are duplicated.

If *all* of these requirements are not satisfied, individual calibration of the wind velocity indicator will be necessary.

Temporarily install the wind velocity transmitter on an automobile. This can be conveniently accomplished on a car equipped for mobile radio operation by attaching the wind velocity transmitter to a

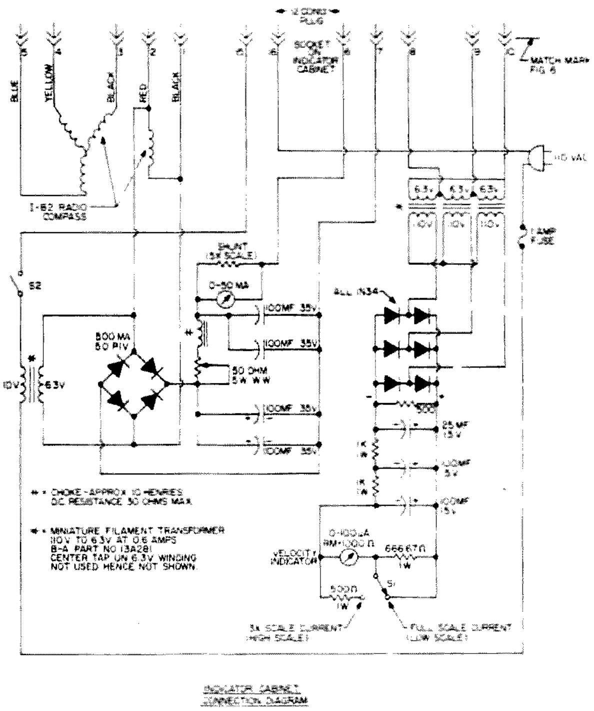


Fig. 10. Indicator cabinet connection diagram.

24" mobile antenna base extension and screwing the extension into the antenna mount on the car turtleback. This will place the wind velocity transmitter above the level of the roof of the car. Run a five conductor cable from the wind velocity transmitter through the rear window of the car to the corresponding terminals on the indicator cabinet which should be on the front seat. In the indicator cabinet, disconnect the dc leads from the bridge rectifier (500 mA 50 PIV diodes). Bring these leads out of the cabinet and connect a 50Ω rheostat in series with one lead to provide adjustment of the field direct current. The direct current to excite the field of the wind velocity transmitter is obtained from the car storage battery and this voltage (12V dc) is conveniently available at the cigarette lighter. When calibrating the wind velocity transmitter, it is important that the field current be exactly 100 mA. Adjustment of the field current to 100 mA is easily accomplished by adjusting the 50Ω rheostat referred to and which, incidentally, is additional to the one in the indicator cabinet and shown by Fig. 10.

Have someone drive the car for you as you will be entirely too busy taking readings to be able to drive. For most accurate calibration a *straight* road approximately 3 miles long and free of obstructions is necessary. Note that the calibration accuracy will be no better than the accuracy of the automobile speedometer.

Start at five miles per hour and increase speed in five miles per hour increments up to the legal speed limit. Tabulate the microammeter reading corresponding with the original five miles per hour speed and each five mile per hour increment. Turn the car around and start at the legal speed limit and decrease speed in five miles per hour increments down to five miles per hour. Tabulate the microammeter reading corresponding with the legal speed limit and each five mile per hour increment. Repeat the entire process.

You will have four microammeter readings for each tabulated speed of the car.

WIND INSTRUMENT
WIND VELOCITY METER
CALIBRATION DATA

SW S1 Position Low Scale

Meter Indication μA	Wind Velocity Miles per hour
0	0
3.5	5
7.5	10
11.5	15
17.5	20
27.0	25
39.0	30
55.0	35
74.0	40
93.0	45

SW S1 Position High Scale

Meter Indication μA	Wind Velocity Miles per hour
0	0
2.5	10
5.8	20
13.0	30
24.7	40
37.3	50
49.3	60
61.3	70
73.3	80
85.7	90
97.3	100

Meter Weston 0–100 mA Model 506, internal resistance 1000Ω. Velocity generator field current 100 mA dc.

Fig. 11. Wind velocity indicator calibration data.

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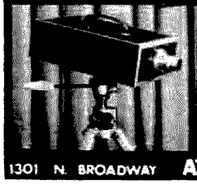

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Adding the 4 readings and dividing the answer by 4 results in the average microammeter reading corresponding with the car speed. By plotting the microammeter readings (average) against the car speed in miles per hour a calibration curve for the wind velocity transmitter may be constructed. In the instrument described, the calibration curve became a straight line at speeds above approximately 35 miles per hour. As a consequence, extrapolation of the calibration curve to 100 miles per hour was no problem. A new scale for the microammeter calibrated in miles per hour can be drawn from the calibration curve.

In the foregoing, a detailed description of the fabrication and construction of the various components has been intentionally omitted. It is believed that the details shown by the various figures provide sufficient information.

. . . W5ZG

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A Modified WB8DQT Weather Satellite

After several months watching APT weather satellite pictures from the ATS and ESSA 8 satellites using the video converter unit described in *73* last month, it was decided to investigate the possibility of modifying the units to permit display of pictures from the new generation of weather satellites in the ITOS (Improved Tiros Operational Satellite) series. The ITOS system, presently in use on the NOAA 2 satellite and scheduled for operational use well into the late 1970s, does not use a vidicon camera to produce its pictures but relies on an ingenious mechanical scanning system to perform this function. As the satellite moves along its orbital track, a mirror, rotating at 48 rpm, scans the earth from horizon to horizon at right angles to the satellite's line of motion. An optical system focuses a narrow beam of visible and infra red (IR) energy, picked up by the mirror, to a series of sensors. One sensor responds to light in the visible spectrum while the other responds to energy in the infra red. As the mirror scans the earth the output of the IR sensor modulates the video subcarrier. While the mirror is back scanning on the spacecraft, the data from the visible sensor, stored on a tape loop during IR transmission, is used to modulate the video subcarrier. The video modulation is identical to the APT format in that minimum amplitude of the 2400 Hz subcarrier represents black and near maximum amplitude represents white. The end result of this time multiplexed format is equivalent to a 96 line per minute video signal consisting of alternate lines of visible and IR data. Vertical scanning for the system is provided by the movement of the spacecraft along its orbital path. The picture is not broken up into a series of discrete frames but rather is built up in the form of a continuous vertical readout as long as the satellite is in range of the ground station. Each line of video represents the area immediately below the spacecraft at any instant in time.

Despite the rather pronounced difference

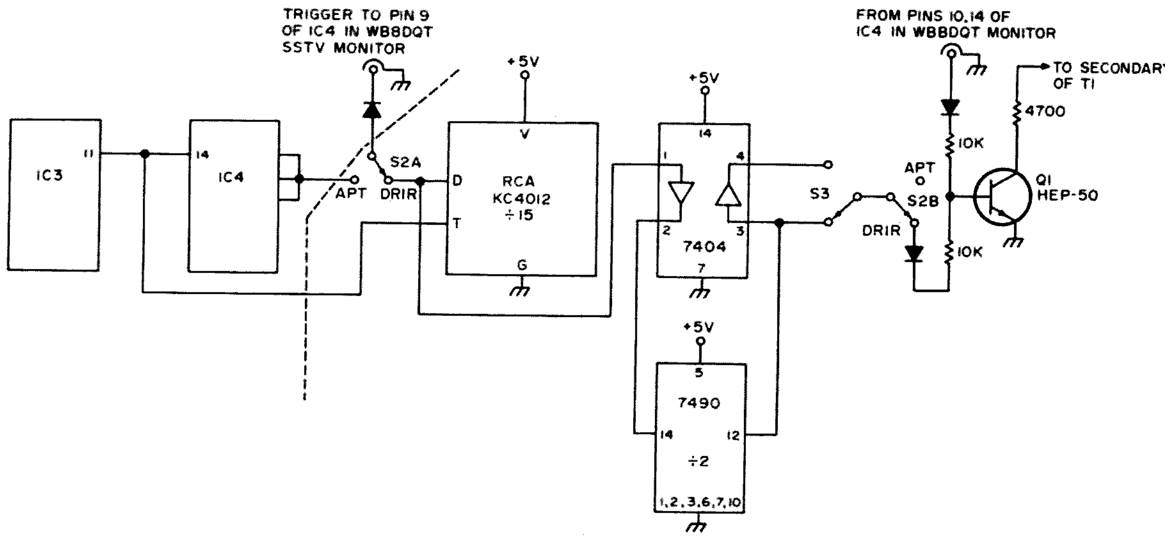
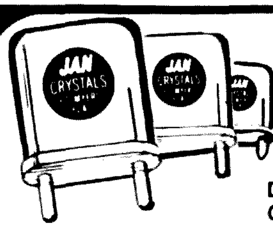


Fig. 1. Modifications to the WB8DQT weather satellite video converter. Original converter components left of dotted lines refer to original circuit for complete connections and other components. New circuit additions in red. The RCA KC-4012 module should be wired to divide by 15 following the instructions with the kit. S2 – APT/DRIR mode switch. S3 – visible/IR display selector. Unmarked diodes – 1N457, 1N914, etc.

between the ITOS DRIR (Direct Reading Infra-red Radiometer) system and the conventional APT format, it proved quite easy to modify the video converter to allow display of the ITOS picture signal. No modifications of the video circuit are required since the 2400 Hz subcarrier is modulated in a similar fashion for both the APT and DRIR modes. The first requirement is to provide a line triggering signal at the 96 line per minute (1.6 Hz) rate. In the original adapter the 4 Hz APT trigger rate was derived via a count-down chain from the 2400 Hz satellite subcarrier using a phase-lock loop as the signal source. Most of this circuitry is also used in the DRIR mode. The output (pin 11) of IC3 in the original adapter is 24 Hz. If this 24 Hz signal is divided by 15 the proper 1.6 Hz signal will be produced. There are many ways in which the divide by 15 circuit could be set up but I chose to go a simple route. RCA markets a number of interesting little IC kits that are available through most of their distributors. One of these, the KC 4012, is a digital counting module that can be wired to perform a number of different counting functions following the wiring hookup enclosed with the components. One of these options is a divide by 15 mode which is used as part of the converter modification. The output of the module, interfaced with the original circuit as indicated in Fig. 1, is routed to a dpdt switch along with the normal 4 Hz from the converter count-down chain. The switch is used to select either the APT or DRIR trigger rate to drive the horizontal monostable in the monitor. The other half of the switch performs another function to be outlined shortly.

The next problem to be solved was how to select the proper video display, either visible light or IR, since it is impractical to observe them both simultaneously. After quite a bit of midnight experimentation the following procedure was adopted. The output of the divide by 15 module (1.6 Hz) is routed to one section of a 7404 hex inverter whose output is then fed into ½ of a 7490 decade counter in the divide by 2 mode. The output of the 7490 or an inverted version of same, obtained by feeding another section of the 7404 hex inverter, is applied to the base of a blanking transistor, Q1, which shorts the video to near ground potential whenever its base goes positive. The end result is that every other line of video is effectively blanked and the blanking sequence is deter-



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mined by whether the inverter or non-inverted 7490 signal is used. The original converter circuit did not incorporate blanking but since it was required for the DRIR mode I decided to let the transistor do double duty and provide retrace blanking as well. This is accomplished by feeding the output of the monitor horizontal monostable to the base of Q1, blanking the video for the duration of the retrace pulse. The other side of S2, used for trigger rate selection (APT/DRIR) is used to disable the line blanking function in the APT mode while retaining retrace blanking.

Construction

The entire modification circuit consisting of the KC 4012 module, 7404, 7490, and the HEP-50 used for Q1 can be mounted on a small piece of perf board and interconnected to the original adapter. The APT/DRIR selector (S2) and the Visible/IR selector (S3) should be mounted on the front panel. A new phono jack will be required for the horizontal blanking signal and this can be mounted on the rear apron. The monitor will also require a new jack for the blanking trigger.

Since the DRIR sweep rates are even slower than those used in the APT mode, still more capacitance will be required in the monitor discharge circuits. The original article described the addition of a 1000 mf capacitor in the vertical discharge and 1.5 mf in the horizontal discharge circuits. These capacitors are retained in the modified version but a dpdt center "off" switch is now used to switch them into service. In the center "off" position the monitor functions normally as indicated in Fig. 2. In one "on" position the APT capacitor values are switched into the circuit and in the other "on" position the DRIR capacitors (2000 mf vertical and 3 mf mylar for the horizontal) are switched in. The value for the horizontal circuit can be obtained by paralleling several units of lesser capacitance.

Operation

NOAA 2 transmits on a frequency of 137.5 MHz and future satellites in the series will alternate between this frequency and 137.62, the frequency presently in use on ESSA 8. Place S2 in the DRIR position. The

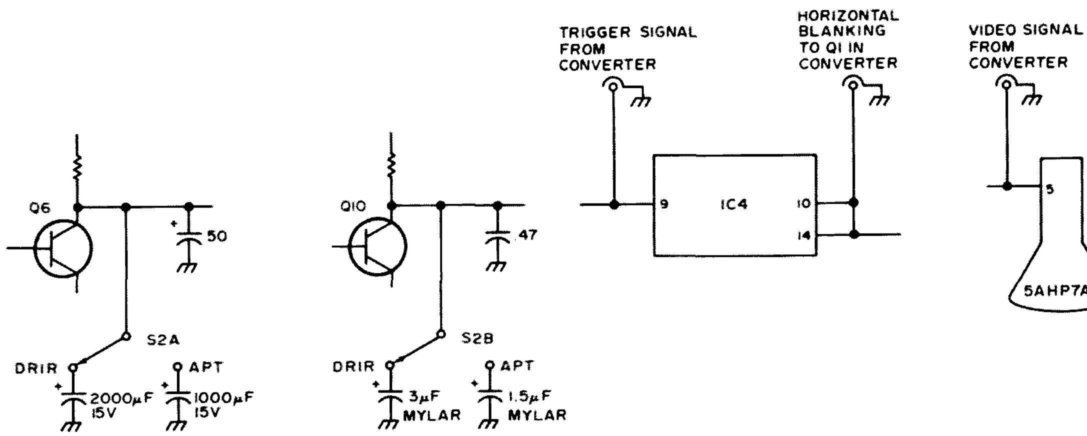


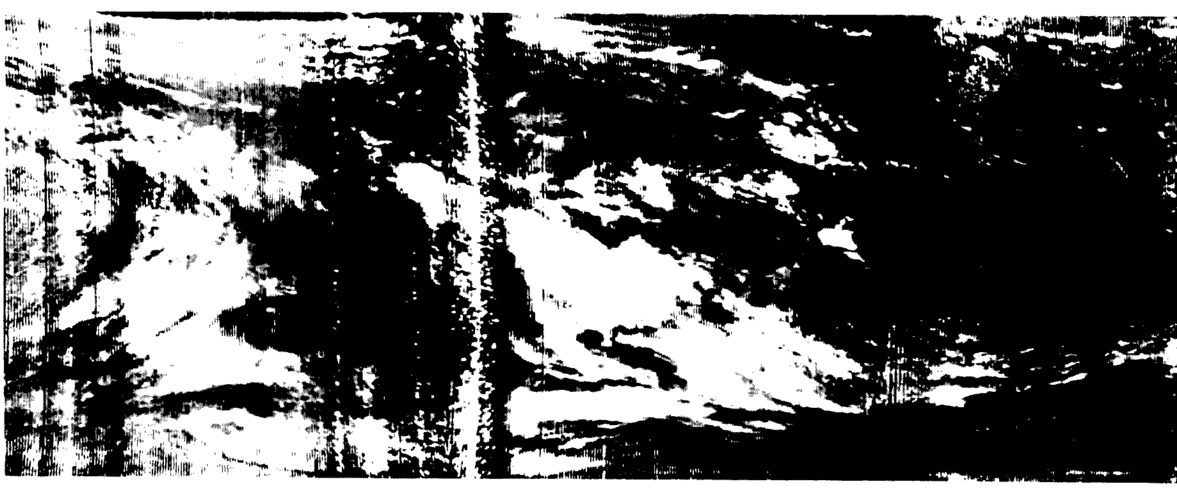
Fig. 2. Complete WB8DQT SSTV monitor modifications for APT and DRIR service. Modifications outlined in the original APT converter are in blue while additional components for DRIR/ITOS service are in red. S2 in the original article was a simple dpdt toggle switch. In this version a center "off" dpdt toggle is used. In the "off" position the monitor functions normally in the SSTV mode. In the APT position the APT discharge capacitors provide proper sweep for that mode while in the DRIR position other capacitor values are used. The trigger, blanking, and video jacks can be mounted on the rear apron with S2 mounted on the front panel.

position of S3 is not important at this time. The monitor horizontal size and centering controls should be adjusted for a sweep that extends slightly beyond the margins of the viewing bezel. The vertical sweep should be set to require approximately six minutes to sweep from top to bottom on the monitor screen. Apply a NOAA 2 signal to the adapter and phase the picture as you would the APT display. A bright seven pulse sync train precedes the picture and can be lined up just off the left hand side of the picture. Adjust the recorder gain control for best contrast. Now observe the region immediately following the sync pulse train. It will be black for the visible light channel and white (cold) for the IR channel. This narrow strip represents the view of space just before the sensor scans across the earth. If you are watching the IR view and want to see the visible light channel simply move S3 to its other position. If you started out with the visible channel then the other position of S3 will provide the IR channel. S3 has no universal calibration – it simply chooses the alternate display to whatever is being viewed at the moment.

During daylight passes, when the satellite moves from north to south, both IR and visible data are available. North will be at the start of a daylight picture sequence. At night the satellite passes overhead going from south to north so the bottom of the picture represents north and the photo should be inverted to show the correct geographic relationships. Night passes produce excellent IR pictures but the visible channel will be black due to insufficient light to effect the visible sensor. The visible light view can be interpreted just like the APT pictures but the IR channel is a little different. The parameters of the IR sensor and associated circuitry are set up so that the coldest objects (space, clouds, etc.) appear white while warm objects are black. Clouds will usually appear white in the IR view but the appearance of the land and water features in the pictures will change during the season depending upon the relative temperature differences in your climatic area.

Due to the geometry of the scanning system only those areas immediately under the spacecraft orbital track, equivalent to a line drawn down the center of the photo, will appear to have the proper aspect ratio. Objects out toward either horizon will be foreshortened. If you have a scanning receiver or an XYL who can switch channels for you, it is fun to record both ESSA 8 and NOAA 2 passes for a given day and compare the results. This is the best way to actually see the optical effects introduced by the scanning mirror of the DRIR system. Such a comparison is shown in Fig. 3. I use a Heath

Fig. 3. Comparison of ESSA-8 (APT) and NOAA-2 (ITOS/DRIR) pictures for the morning of November 3, 1973. Both satellites made close to overhead passes over the author's Michigan QTH. The ITOS/DRIR format consists of a continuous strip of coverage for the entire period the satellite is in radio range. The ESSA-8 photograph is essentially a "snapshot" taken at one point in time and read out over an extended (200 sec.) period. The prominent band of noise in each picture is caused by a null in the fixed antenna pattern. The IR view from NOAA-2 was rather uninteresting during this pass due to the overall cooling that was taking place on that day. Similar cloud patterns are present in both satellite views and the pronounced foreshortening of features toward the horizon is clearly evident in the NOAA picture. North is to the right in both pictures.



GR-110 scanning receiver with a preamp and an audio actuated relay that turns on the recorder whenever either satellite breaks the receiver squelch. Maximum flexibility with this type of unattended operation required a good omnidirectional antenna and a mast-mounted preamp. If you desire precise information on the recorder "on" periods use a stereo recorder and put CHU or WWV on the alternate channel. In general, the NOAA satellite will be found to have a stronger and more consistent signal. Despite the unusual optical effects, the DRIR system actually works out better in the long run than the older APT format. ESSA 8 is spin stabilized in orbit so much of the time it transmits a tone between pictures while it is rolling to a proper attitude to take another picture. It's very frustrating to hear this inter-picture tone coming in loud and clear for several minutes only to have the satellite pass through a null in your antenna pattern just as picture transmission begins – ask my wife who monitors the language drifting out of the basement during the evenings! With the DRIR system you get usable video whenever the satellite is coming in – there is no dead air time.

Adding this modification will provide you with a video display system which is compatible with all the weather satellites currently in use. Since DRIR systems of the ITOS/NOAA type will be flown well into the end of this decade you've lots of time available to use the unit! Grab your atlas, weather map, and tape recorder and come up and join the fun!

...WB8DQT

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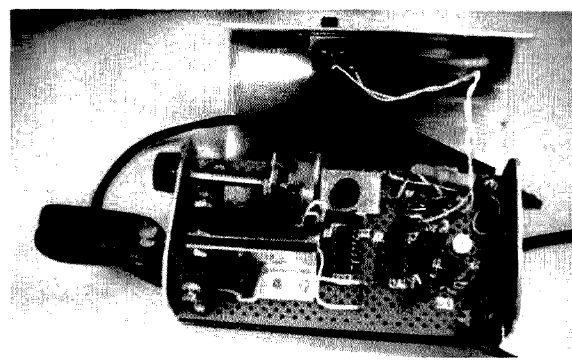
Can a Keyer Be Logical?

A keyer made principally of ICs is hardly new to most people, but if you have not made one, you've missed a lot. They are very easy to wire and the circuit logic is surprisingly easy to understand. All this makes it practical to change things around many ways so that your keyer is tailor made to fit your needs. The one described here is designed to get rid of every pain in the neck trouble that used to bother me while keying my rig. It will complete any dot or dash started every time. You cannot start a dot or dash until the one being made is complete and is followed by a space. Also, the speed can be adjusted from 1 WPM to 35 WPM. It will key a -110V dc grid-block system and handle up to 30mA. Its power requirement is 5V dc at an almost constant 30mA making the power supply very simple.

Circuit

The circuit is not hard to understand because things just go on and off at a logical time. However, it is necessary to be familiar with the way the various components go about it.

Starting at the beginning. A silicon control rectifier (SCR) will not conduct from



anode to cathode until a small positive power is applied to its trigger lead. When it starts conduction the trigger loses control and it will not stop until the anode to cathode voltage is either removed or reduced to a very small magnitude. A unijunction transistor will not conduct B2 to B1 until a positive voltage just about as large as its supply voltage is present at its emitter. But, unlike the SCR, it will stop all conduction after the emitter power is removed. A NAND gate will have an output of practically 0V when its input terminals are open circuit or connected to the supply voltage. When any one of the inputs is grounded to the common side of the power supply, the output snaps up to the supply voltage potential. A JK flip flop output terminals are called Q and $\overline{Q}$ (A and non-Q) and are never at equal potential. One is always at the supply voltage potential and the other practically 0V. Q and $\overline{Q}$ will switch potentials each time the clock pulse (CP) terminal changes swiftly from the supply voltage to ground potential, providing that all other inputs are either open circuit or connected to the supply voltage. The set, preset and reset (S, PS, RS) will determine the Q and $\overline{Q}$ potentials when they are held on ground and

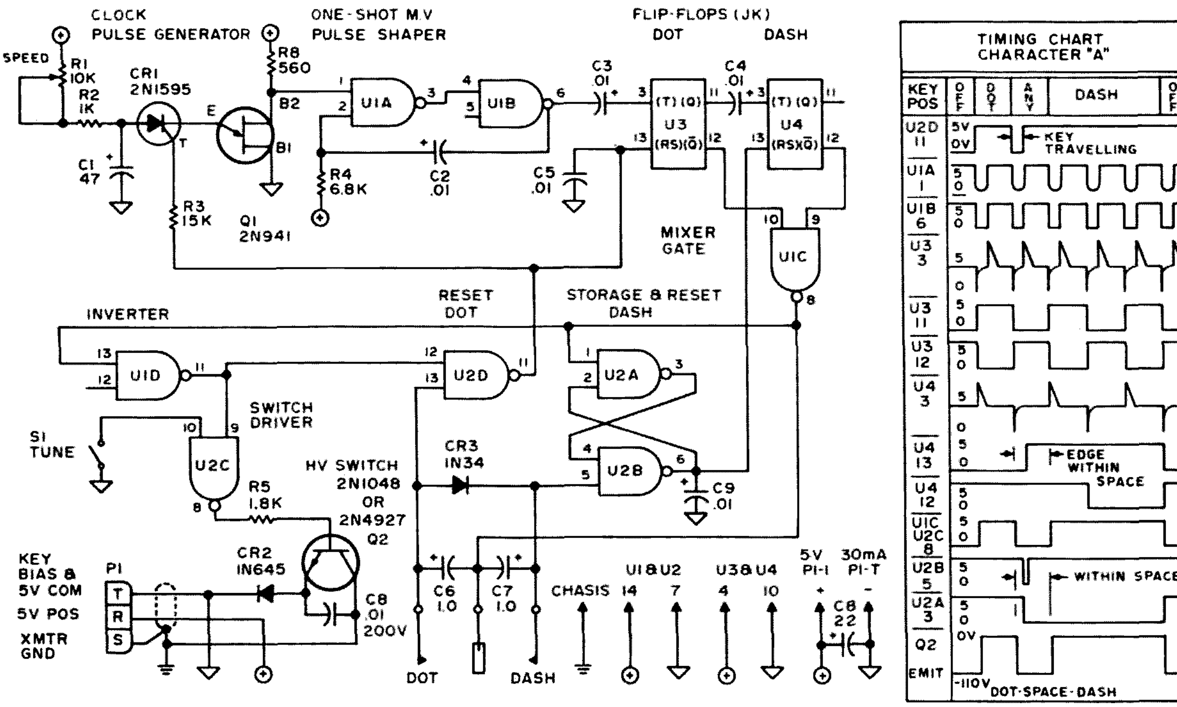


Fig. 1.

will not allow them to change no matter what happens at any other terminal. S and PS will even override the RS. When one of the gate inputs is grounded, Q and $\overline{Q}$ may switch at the time of the negative CP if the proper gate is selected, or remain unchanged if the other gate is grounded. Finally, a NPN transistor will conduct collector to emitter when its base is positive in relation to its emitter.

When these components are connected as shown in Fig. 1, they will snap on and off, making dots, dashes and spaces as directed by the key location. The operation begins when the key armature supplies a 0V signal (as measured from the keyer power supply common) from U1C-8 to U2D-13. Hereafter we shall call this kind of signal LOW and one measuring the supply voltage potential HIGH instead of 0 and 1 as in computer talk. If the key was in the dot position, this

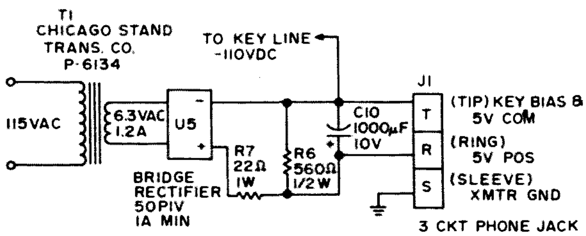


Fig. 2.

will remove the LOW reset signal from CR1-T and U3-13 replacing it with a HIGH, triggering CR-1 on. Q1-E is then connected to its timing capacitor, C1, and resistors, R1 and R2 through CR-1 and a series of pulses are formed. The number of pulses depends upon how long the key is closed, but will never be less than two, the number required to make one dot. The negative pulses are fed to U1A-U1B where they are shaped and given a very fast fall time. C1 is discharged at the end of each pulse causing CR1 to be cut off. In order to make sure that a second pulse is always formed, after C1 recharges through R1 and R2, it is necessary to keep CR1-T at a HIGH even if the key is released or moved to the dash contact. As shown in the Timing Chart, Fig. 1, this is accomplished by U3 being flipped by the first pulse causing U1C-8 to be set HIGH, which sets U1D-11 LOW, which sets U2D-11 HIGH which keeps CR1-T and U3-13 at a HIGH. When U1D-11 is LOW (or S1 is closed) U2C-8 is HIGH and Q1 will conduct until U3 flops. This action will make the Dot Reset line LOW again, Q2 snaps off (if S1 is open) and the system is in the OFF state and ready to respond to the key again.

The keyer power supply, Fig. 2 uses a 6.3V ac filament transformer connected to a

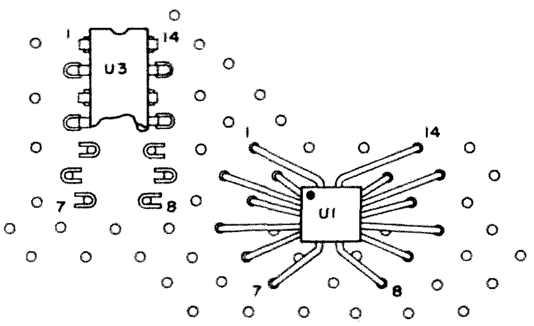


Fig. 3.

bridge rectifier and simple filter circuit. It is designed to be mounted inside the transmitter so that one cable will run to the keyer.

Keyer Construction

The keyer construction is a two part project, electronic and mechanical. Both can be completed with around the shack tools and materials. All electronic components and the key are mounted on a 6.2cm x 12.7cm (2 7/8" x 5") piece of Vectorboard which has 1.6mm (.062") holes with 5m (.2") on center spacing.

One of the goals of this project was to devise a practical way of mounting the flat-pack type IC gates without a printed wiring board. They mount neatly and are easy to wire by staggering the Vector flea clips seven along the side in a diamond pattern with three pins diagonally below and to the side of the diamond,as shown in Fig. 3. The flat-pack leads are fanned out, cut to length, pushed through the clip holes and soldered in place. The long TO-116 flip flop IC packages were given the same treatment by staggering seven clips down a side with their large ends toward the IC and their tabs alternately turned in and out. This pattern is also shown in Fig. 3. Most of the wiring is under the board and should be 28 to 22 AWG insulated with a solid conductor for the best appearance.

Key Assembly

The key assembly has a paddle made of tempered masonite with its shaft bolted or rivited between two 5.1cm (2") long aluminum angles 2.5cm (1") high, 1.2cm (1/2") bottom flanges, and .6mm (.025") thick. The bottom flanges are cut off for 3.1cm (1 1/4") until only a 1.2cm (1/2") strip remains at the top to be fastened to the paddle stem. This assembly is fastened to an aluminum plate along with a 2.5cm (1") cube of insulation cut out in the center making it a "U" shape with .6cm (1/4") walls. Holes are drilled and taped into the sides to provide for adjustable dot and dash contacts made of brass bolts. These line up with another brass bolt passing through the metal of the paddle assembly and is the armature contact. Cutting a slot toward the back of the angles, making them look like a block letter "L" is how the spring action of the key is adjusted. Two other metal parts are bolted to the circuit board. The 1.9cm (3/4") wide angle that holds the large, rugged pot, R1, and a small piece of aluminum to heat sink the switch transistor, Q2.

The base of the keyer is about 8mm (5/16") thick and is made by pouring about 3 pounds of melted fishing sinkers into a mold. With rubber pads on the bottom of the base this key, it will not slip around the operating desk. The circuit board is mounted to this base with spacers and bolts in each corner, along with the back and front panels of the cover. These panels are 5.1cm (2") high, 1.6mm (1/16") thick aluminum with corners rounded to fit the wrap around top. The slide switch, S1, is fastened to the side of this top. The call letters and QTH are cut out of your QSL and cemented to the top, making it a very personal keyer.

My keyer is connected to the transmitter with a 61cm (2") piece of two conductor shielded wire with a three circuit phone plug on its free end. I connect the shield to the plug sleve, the 5V dc positive keyer power to the ring, and the key bias line along with the 5V dc common to the tip.

Conclusion

There are no adjustments required to make the keyer work properly, but if troubleshooting is required it can be carried out at slow speed with a multimeter or an oscilloscope at high speed. My keyer has been chugging along for months without a sign of trouble and I do not expect any within the next decade.

...K3QKO

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The Perils of Reaching Novicehood

As any old timer will tell you, it's "awfully" easy to get your Novice license. Any ten-year-old can do it with no trouble at all. Unfortunately, it's also deceptively easy for the old timer to forget all those little difficulties that he encountered back when he was starting. Problems nearly always look simple in hindsight.

Looking at things from the other side of the coin, though, the average newcomer is faced with a wide variety of problems. How am I going to learn all this theory? The code? Who's going to give me the test? Where am I going to get the equipment? Buy or build?

There are many study manuals available to help answer some of these questions, but somebody must guide the prospective amateur to the manuals in the first place. After all, money is usually a rather precious commodity for the beginner, and any study guides of value aren't cheap enough to be found by trial and error.

In the last two years, I've made the slow climb up from Novice to General, and finally to the Advanced, so I can well appreciate just how difficult it is, and where the trouble spots lie. Many a time I've wished that someone had guided me through the easier paths.

As with any beginner I often encountered little articles, such as this one, that made nice general statements about how to become an amateur, but few dealt with the subject on the poor man's level where most of us start. You don't just "go" and buy $50 worth of parts to build a transmitter that's supposed to save you money in the first place, and you can't just "find" a ham to give you the exam.

It's not that easy, and it is in these areas that I'd like to throw in a few ideas. So if the above problems seem painfully familiar, then read on.

The Theory

Back in 1973 the FCC did some serious revamping of the Novice exam. Until that time, the emphasis was placed on radio laws and procedures, with only enough theory involved to assure that the Novice could understand the regulations. Little by little, the theory crept in, first with some schematic related material, then electrical laws, finally culminating in the 1973 changes.

Essentially, the Novice exams changed from something that you could just memorize for, to a more comprehensive exam requiring an application of actual knowledge. Memorizing was out and so it remains today. The student must actually learn the necessary material.

There are two fundamental sources of information for the prospective ham. The first, an actual study guide specifically intended to prepare the beginner. Such a guide assumes that you possess little more than a desire to learn, no prior knowledge is required.

Several are available. The newest is the 73 Magazine publication *The Novice Class Study Guide*. Because of its newness, this appears to be the most comprehensive and

up to date course available at this time. Additionally, if you want to spend the money, 73 also has a new cassette theory course on the market that allows you to absorb the information while still keeping your hands free.

This can be an excellent way to learn because you can play the tape over and over again until the contents sink in, instead of having to reread a book again and again, which quickly becomes pretty tedious. Not only that, the tape will allow you to do something else while you're listening so you can play it on your way to work or whenever a spare moment presents itself.

The American Radio Relay League (Newington, Conn. 06111) also offers a course called "Gateway to Amateur Radio." The ARRL manuals have gotten thousands through the old style Novice exams. One caution though, make sure that you get a recent manual, otherwise you might find yourself studying old material dating back to before the exam change.

Numerous other companies offer various reprints of FCC question lists, with appropriate answers, but the FCC tends to rephrase most of the sample questions quite liberally, so that won't really help you quite as much as a study guide would. If you really know the theory behind the answer, then you can handle virtually any re-phrased version of a question; but if you only know one stock answer for one stock question, then you're practically bound to fail because you'll hardly ever see the stock question.

The second way to learn is to locate a nearby amateur radio club that is offering Novice theory classes. The best people to contact about this are the local hams, and you have to find them first, so more about that later.

Before you go out and buy anything, though, it certainly would be a good idea to check the public library, especially if you're in a big town, because most of the guides I mentioned are well enough known to possibly be there.

The Code

The International Morse Code is a requirement that still lingers around the amateur exams. There's no easy way around it, only actual practice will help you to finally master the code, but don't give up hope if you're having difficulty, hundreds of thousands have conquered it, and you will too.It just takes some people longer than others.

If you have a receiver, one of the best ways of learning is to copy actual on-the-air CW. Eighty meters has the reputation for harboring the slowest operators but don't neglect the other bands, there are always some slow people there too, especially on 15.

The ARRL offers on-the-air code practice at the five wpm and up level every day, either in the morning or night. A stamped self addressed envelope to The American Radio Relay League, Newington CT 06111 will get you an up to date schedule of the code practice times and frequencies.

If you don't have a receiver yet, and you do have a tape recorder, Radio Shack and 73 Magazine both market an excellent code practice tape. The 73 tape will save you $2 and is a more grueling course, with the useful reward of being prepared for something a lot harder than you will actually find. This is more of a help than a hindrance because you'll be pretty nervous while you're taking that code test so it helps to be more than ready.

Also essential is a key and code practice oscillator. These gadgets will allow you to try your hand at sending the code yourself. Remember, this is also an important part of the required test, but don't let it worry you. Once you're able to copy the code (transcribe the sounds onto paper as the proper letters), sending will be a lot easier than it might otherwise seem.

The secret is to memorize the Morse alphabet not as, for example; 'U' is two dots and a dash, but as 'U' is a particular sound, "dididah." If you differentiate between letters by stopping to count the number of dots and dashes then you won't be able to copy fast code. However, as you gain experience, the more you listen to it the more you will tend to move away from the "counting" method.

Radio Shack sells a beginners key at approximately $1.50. For about three dollars more, a workable code practice oscillator can be constructed from a battery and the high frequency buzzer or transistorized oscillator module, also available from Radio Shack.

By the way, if you have neither receiver nor tape recorder, the next best thing is to coerce a friend into becoming interested in amateur radio. That way you'll at least have someone to practice with. As with the theory, check with the local hams to see if there is a club that may be offering code courses for prospective amateurs. Such classes usually meet once or twice a week for several months (often during the school summer vacation) and you need only pay for your books, otherwise there's often no charge.

Finding A Ham

So you need some advice, some help with equipment, or a person to give you your license test? You know that you need a ham, but you can't find one. Well, if you happen to have access to an amateur Callbook then you're in luck. The Callbook may be found in the larger libraries, or, if you can afford $9.95 plus 50¢ for postage it's available from Radio Amateur Callbook Inc., 925 Sherwood Drive, Lake Bluff IL 60044.

Chances are you would buy one anyway, once you get your license, so it will be a good investment for the future. A careful search through the entire (yes, the entire) listings under your call area will usually turn up quite a few hams in your town.

Remember, a ham is addicted to the local parts emporium. A visit to the local radio supply stores could well be rewarding. Talk with the owner and see if he will give your name and address, and describe your plight, to any hams who might be willing to help.

In fact, you'll probably find that the guy is a ham himself. (All hams secretly want to own their own parts stores, for convenience if nothing more.) If this doesn't pan out, look for ham antennas. This can indeed be a little hazardous, you will probably run into a couple hundred CBers before you finally hit a ham.

The only hint that I can give is that hams generally have larger antenna systems, but don't count on it. Most of all, don't discount any possibilities. Also try looking for license plates with amateur calls.

It would also be a good idea to send your name to the 73 "Ham Help" column. Only a small percentage of the hams who read that column will be in your immediate area, but you never can tell. Above all, don't be bashful. If you find a ham, don't be afraid to ask for help. The worst thing he can say is "No," and usually he will be more than happy to give you a hand.

The amateur population has been dropping lately, and few hams will discourage a beginner. Politeness counts, after all hams are people so you're bound to meet some good ones and some bad ones.

Equipment

The buy or build question has been pretty much beaten to death ever since commercial equipment appeared on the market. Basically, it all comes down to the amount of money you want to spend. Homebrew equipment isn't as inexpensive these days as it once was. Especially if you buy completely new parts. The secret to home building is to be a good scrounger. It all depends on what you will settle for. If you want a good all band rig that will serve your needs when you get your General, then expect to pay accordingly for the necessary components. If, on the other hand, you can tolerate a two band rig (say 40 and 15 meters for best versatility), then a reasonably decent 75 watt rig can be thrown together at considerable savings over its commercial equivalent.

Parts can be obtained at auctions, flea markets, from TV repair shops or, for that matter from the dump. Ask your friends if they have any old radios or TVs they might have stashed away in the attic. It's surprising what can be cannibalized from an old TV set. If nothing else, the power supply in the older sets will comfortably run a hundred watt rig. Visit the local repair shops, most of them aren't taking used TVs in trade anymore but there's still a slim chance that they may have something to get rid of. In fact, here's where the dump comes in. If the sets aren't being traded in, then they must be

going somewhere. I've heard of several people who have picked up quite a few working sets this way. Unfortunately, some dumps willingly accept donations but aren't particularly keen on parting with anything.

In the long run you can only get so much from a TV, so some of the higher power stuff, like 6146 finals and air capacitors probably will be somewhat more difficult to find. Such components can be picked up for around a dollar at most auctions, as can low power transformers, so don't overlook this possibility. Nearly all hams are parts collectors, so if you find one, he may have some of the things you need. An offer to pay for the stuff may be turned down, but it certainly is a good idea to offer none the less. Some people value their junk box more highly than others, and quite rightly so. Good parts are sometimes hard to find.

There is only one major problem with building your own station from scratch. If it's your first project, you can get very discouraged if it doesn't work right off the bat. This is especially true if you have decided to build your own receiver, which I certainly wouldn't suggest as a beginner's project. Don't expect instant success. Few pieces of equipment work immediately after they are built. Overhauling is nearly always needed unless you did a very exacting job. If you've decided to buy the transmitter and receiver, it's a good rule to follow to buy the best receiver you can afford, even if you have to overextend yourself a bit. The old maxim "if you can't hear them, you can't work them" is painfully true, as many bargain hunters have discovered, much to their dismay.

Once again, auctions are an excellent place to pick up a complete Novice station for under a hundred bucks. Occasionally, although it can't be counted upon, an old DX-100 or Apache transmitter will be available for about 50 bucks. Similarily, a National NC-109 or Hallicrafters receiver might also go for around $50. However, be wary of second-hand equipment in general. Quite often it's necessary to put considerable work into the gear before it will operate properly or reliably. Don't let this turn you off, just be careful in your selection. Try visiting any hams in your area, too. Many people keep their old Novice station, or have an old AM and CW rig that they may want to part with for a lot less than you could buy it elsewhere. (Sideband made many such rigs nearly obsolete, so there is hardly a market for them anymore.) As I've said before, don't be bashful, you can save a lot of money this way.

Conclusion

It may seem to take an intolerably long time to get everything ready to go on the air. You may even have to save for years to be able to afford the kind of equipment that you want. You may not be lucky enough to hit any bargains and it might cost considerably more than you expected to get everything needed.

Even after you've finished preparing for the test, it takes at least two weeks between the time you send in a 610 form (filled out by the ham who will give you the test, it can be requested in advance from the nearest FCC office), before the actual exam papers will arrive. To top that off, if you pass, it will take up to six weeks (and contrary to what the FCC claims) maybe more, before your license will arrive.

Despite this dismal situation, it is well worth while to pursue, and obtain, the Novice license. It is the stepping stone that will allow you to gain needed experience, and the necessary code speed to pass the General exam.

The Novice bands are crowded and you will occasionally lose a contact due to interference, but it's all a part of a really rewarding learning experience. People tend to disparage the Novice Class because it looks easy in comparison to the General, but they forget the fact that the license requires a raw beginner to learn quite a great deal of information. You not only need to be familiar with how the equipment operates, but with how to maintain it, and stay within the regulations.

Indeed, the Novice license is an achievement that can be looked at not only as an accomplishment in and of itself, but also as the beginning of a path that leads you into a lifetime of enjoyment in the field of amateur radio.

...WA1SNG

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FM Simplex - Can It Be Solved?

These words came over my 2-meter FM set one evening as a couple abrasive characters captured the frequency on which I was communicating with W6YKS. Several frequencies for simplex 2-meter FM operation have become popular in central California, one of them being 146.46. The "gentlemen" in question operate remote bases (of questionable legality since they can be operated from mobile control points, not permitted under the rules) who consider this particular frequency to be theirs. We were advised that other types of operation on that frequency were illegal and that we were not cooperating with the CARC. It seems the CARC specified that frequency for remote base intercom, although most of the remote bases clobber everybody on 94 or 52.

It would be nice if everybody would cooperate with everybody else. We would be able to turn the Pentagon into a museum and put Mr. Kissinger on a pension – or at least a different assignment. It seems the CARC starts the non-cooperation by not recognizing the standardized simplex channels suggested by the ARRL, CARC's sponsor. A number of repeater inputs and outputs are located in the simplex areas. This is really unfortunate, since one of the things sorely needed on 2 meter FM is a good supply of simplex channels. There really is no reason to tie up a repeater with crosstown contacts which could easily be done on simplex, saving the repeater for more demanding uses and saving the ears of those monitoring.

Another unfortunate gaffe is the habit of the manufacturers of installing 94 simplex in new rigs. 94 actually is not allowed as a simplex channel, but as a repeater output. In the early days, of course, when only a few people were on FM, one could use simplex or the repeater and nobody would mind, but now we have dozens of repeaters available in most parts of the country, a lot of people using the band, and little room. Working 94 is about like trying to carry on a contact on 75 in the early evening – it is almost impossible. Too many stations plus repeater outputs, everybody doubling, capturing, etc., etc. 52 is supposedly a simplex channel in the allocation plan, but it suffers from much the same problem. . .everybody tries to get on at once, and the gutter tactics usually reserved for working 20 meter DX phone come into play – name calling, excessive power, etc.

Another simplex frequency popular here is 147.54. Not being too crowded, it is easy on the ears to monitor with only a few signals coming through from time to time. This fits both the ARRL and CARC plans, so everybody can cooperate with everybody on this channel.

One simple solution would be to use simplex frequencies in the 145 MHz portion of the 2 meter band. There is some AM activity left, but not too much; FM'ers and AM'ers would, of course, want to cooperate with each other. When I first got on the air 145.35 was the hot AM frequency on 2 meters, but I hear very little activity around here any more. Some of the diehard AM'ers have purchased FM rigs and have joined the crowd. For many good reasons, of course: low ignition noise; minimal QRM, since the offender captures the channel; and more-or-less agreed-on channelization which makes finding each other easy, especially with crystals. Various areas could agree to

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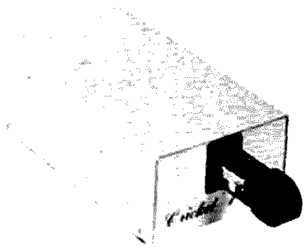

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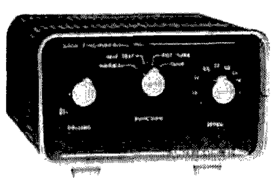

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cooperate on using several channels in a particular area. In this area, we have five generally-used simplex channels so it is quite easy to find anybody you may wish to locate (or to avoid anybody you may not wish to hear). Cooperating with the generally-accepted plan, everybody authorized for 2 meters could use 33 extra simplex channels:*

145.02	145.17	145.32	145.47
145.05	145.20	145.35	145.50
145.08	145.23	145.38	145.53
145.11	145.26	145.41	145.56
145.14	145.29	145.44	145.59
145.62	145.77	145.92	
145.65	145.80	145.95	
145.68	145.83	145.98	
145.71	145.86		
145.74	145.89		

***Holders of general class and higher licenses can use 30 additional channels from 144.12 to 144.99 and still cooperate with the plan. The 2-meter DX'ers and sidebanders might not consider all this as cooperating with them, however.*

To avoid intermodulation and other rf-type problems, I would suggest taking one line per area (02, 17, 32, 47, etc.) for use. That is, Sacramento use one line, Stockton another, Modesto a third, and so on.

I can visualize the situation getting to be like the AM broadcast band in a few years with the low-level machines, high-level machines, etc., all demanding room and some QRM protection. The broadcast band is divided into three types of channels (clear, regional, local) for service to the intended geographical areas. If the amateurs can work something out by cooperating with each other it will forestall the day when the government and Mr. Walker will step in and take care of the situation for us.

I have found one location where monitoring 94 can be fun. That's Winnemucca, Nevada. There are three (3) licensed amateurs there. W7JZ says he can monitor the frequency all day and hear only a few voices from time to time as people drive through town and mash down on the PTT to see if anybody is around. After a 10-minute QSO, the mobile has driven out of range. Joe says you meet a lot of interesting people that way.

...WA6CPP

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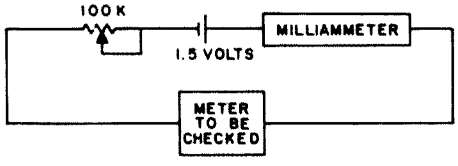
Meters and Meter Faces

Meters never seem to have the proper faces or sensitivity and there is an occasional need to modify them. A simple but most effective way to do this is to take the meter apart very carefully, remove the screws which hold the meter face and slide it out from under the pointer. Take a soft rubber eraser and gently rub off the printing which is not required (see the half-erased meter face). You must not scrub through the white surface but merely the printing, or you will leave dark marks. You now have only the printing you want to keep, so you can now put the new printing on the meter face by using Datak Instant Lettering (Newark Corporation, 223 West Madison St., Chicago IL). These can be instantly transferred by rubbing a pencil over them. One box will do any number of meter faces, and you will also be able to letter your front panel, etc. If you want to remove them from the meter you simply lift them off with the sticky side of cellophane tape (see the converted meter face).

When you reassemble your meter, slide the face under the needle and screw it down, gently blowing your breath on the needle to see if it moves freely and goes across the dial. This is merely an added refinement to make certain you haven't fouled the meter movement.

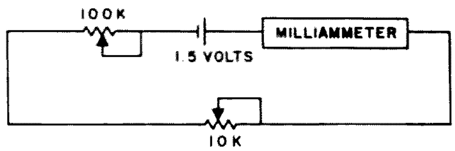
Before you change the face to a new scale you must adjust the meter movement to match the new scale. Generally a dc meter has a small coil inside the case suspended between two pieces of magnetized metal. This is the most common and is called the De Arsonval movement. The first thing you must know is the basic meter movement, which is the voltage and/or current needed to deflect the needle full scale. When you take the meter apart look inside at the meter terminals coming through the case and see if there are any extra components, either in series or in parallel, across to the moveable coil. If there are other parts, snip them out. You can do this by carefully reaching down inside the meter magnet, but do not attempt to remove the movement from the back of the case. This will give you the basic meter movement tied to the meter terminals.

Starting with all the resistance in the circuit, put a known milliammeter in series with the meter, a 100,000Ω potentiometer and a 1½V battery such as:

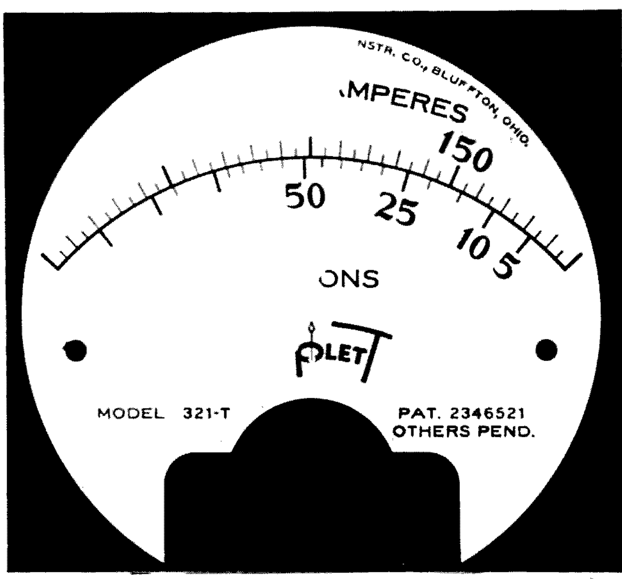


Adjust the 100K potentiometer until the meter you are checking reads full scale. Read the current on the milliammeter. You now know the full scale current of the meter movement.

Remove the meter and insert a second 10,000Ω potentiometer in place of the meter you are checking:

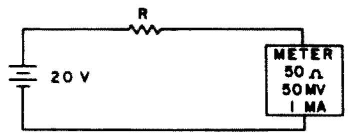


Adjust this 10K pot until you have the same current reading on the milliammeter. Now remove the pot you just put in and measure its resistance. This is the resistance of your meter. Now, simple ΩE=IR, or meter current times meter resistance, will give you the voltage needed to drive your meter full scale.



Partially erased meter face.

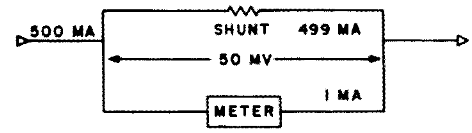
Now you can make either an ampmeter or voltmeter out of your basic meter movement. For example, suppose you find that your meter has 1 mA full scale current and 50Ω of resistance, and has 50 millivolts full-scale voltage defection. Now suppose we want a 20V meter. The circuit would appear this:



R = E/I = 20 - .05/.001 or simply 20/.001 = 20,000Ω; therefore, R = 2-,000 - (resistance of meter) 50Ω = 19950Ω.

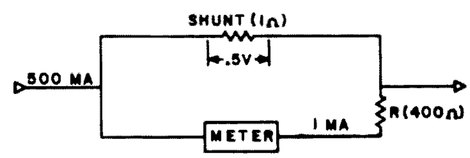
However, there would not be much error in using the 20,000Ω resistor. The better the resistor the less error; a 1% tolerance would be very good.

Suppose you want a 500 mA meter. The basic circuit would be:

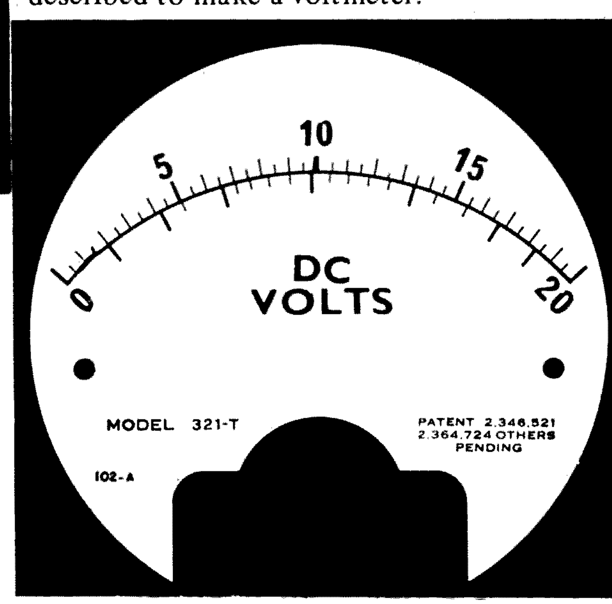


and you could arrive at a value for the shunt resistor:

R = E/I = .05/.499 = approximately .1Ω. However, the meter movement would be sluggish since the movement acts like a small motor when the needle moves and the shunt shorts it out. The way to get around this problem is to use this circuit:



Pick a shunt of 1Ω; the voltage across this would be E = I X R = .5 X1 = .5V. Now the meter is used as a voltmeter to read the .5V, and R_1 would be R = E/I = .5 - .05/.001 = .45/.001 = 450Ω - 50Ω = 400Ω. This is actually the same thing as using a system described to make a voltmeter.



Convertered meter face.

You can now change your meter face and movement to meet your particular requirement. Of course some reasonable thought must be given this; you would not use a basic 1 amp movement to measure 1V, nor would you use 1a 10 mA basic movement to read 100 μA.

. . . W5IUR

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Slow Scan Tape Secrets

Sooner or later just about everyone who is involved with SSTV winds up recording SSTV signals on magnetic tape. The reasons are most likely these three: (1) it's easy, (2) it's cheap and (3) it's versatile. TV broadcast stations use magnetic tape for much of their program material for the same reasons. You can buy a reel of tape that will let you record an hour's worth of SSTV for an extremely reasonable price. And it's easy. Hooking up a tape recorder to record and play back slow scan video is no more difficult than hooking up a stereo component system. Some commercially manufactured SSTV monitors even provide the necessary switching and signal routing facilities inside the monitor, so all you have to do is literally plug it into your rig and a tape recorder.

Once a tape is prepared you can sit back and relax while you transmit a series of pictures to the guy on the other end of the QSO.

And tape is very versatile. Once you have "stored" your pictures on tape, you can rearrange, delete, add, create special effects, or build a "program" of video material for transmission. Also, you can record all received signals and form a magnetic tape QSL file on all those exotic DX stations you work, ready to play at any time to convince the assembled skeptics. By editing the tape you can save the very best frames of each DX QSO and eliminate the ones with QRM, noise, fading, etc.

To do the best job I recommend using a splicing block and single-edge razor blade to cut the tape. Those all-in-one splicers are O.K. for most home audio recordings, but are not quite as precise as the block and blade method. The all-in-one units most often use special blades and have a more complex mechanism, which might be more likely to develop trouble when they grow old. There's not much that can go wrong with a block of extruded aluminum.

I'd also recommend using a regular reel-to-reel type tape machine to do your editing, rather than the cassette recorders. It is possible to edit tape in the cassette format, but it takes too long and requires too much precision. Cassette tape is only 1/8" in width, making it really too narrow to handle easily. Also, cassette tape is recorded at such a slow speed (1 7/8" per second) that it is difficult to edit well with cassettes. It *can* be done, but you have to mark the tape very carefully, fish the tape out of the cassette,

cut, splice and then pull it back into the cassette for *each splice.* Cassettes, of course, are convenient; you can slip a cassette in and out of a machine in less time than it takes to tell about it. They *are* great, however, for storing things you don't want to edit, such as CQ's, standard QSO information, sign offs, and so on. But when you want to edit tape, reel-to-reel is the best system to use.

Record your TV material at the highest speed you can. This makes the editing easier, since the video information will be recorded on a physically longer piece of tape. One frame of video takes 15" of tape at 1 7/8 ips; at 7½ ips, the same frame takes 60" of tape – 5'. Therefore, any errors in editing the tape represent a much shorter interval of time at 7½ ips than any slower tape speed: a ½" error is about one line of video at 7½ ips, but at 1 7/8 ips, the same ½" is four lines of the picture. Editing tape is *much* less critical with material recorded at 7½ ips.

Editing the tape will be very easy if you have a way of disengaging the pinch roller (idler wheel) that drives the tape against the capstan. The capstan is the rotating metal shaft which is near the tape heads. Some tape machines have this facility built into them, usually it is called a "pause" control. The advantage of this little gizmo is that it lets you stop the motion of the tape while the machine is still in the playback mode. Then you can shuttle the tape back and forth across the playback head by hand while listening to the video at the same time. With a little practice you will be able to hear the vertical sync tone – it sounds like a low-pitched boop which is much longer in duration than all the other tones on the tape. The vertical sync tone marks the start of a video frame.

When you have located a frame of video that you'd like to isolate, (either to save for another tape or to remove because it's defective) move the tape by hand until you can hear the sync tone. Then, carefully move the tape backwards until you hear the sync tone again. I find that the best way of shuttling the tape is to use two hands – one on each reel – and turn both reels very slowly to find "the spot." Now that you've located the frame that you want to edit, you'll have to mark it. Most popular of the marking devices is the china marker or grease pencil. Some of the new felt-tip marking pens can be used also. Carefully put a line across the width of the tape at the spot that is right over the *center* of the playback head – that's the one closest to the take-up reel. Be sure to mark only the back of the tape, the side facing you, and take care not to get the grease all over the playback head. It might make the tapes sound muddy.

It's probably going to take a bit of practice for you to find the edit spot if you have never edited magnetic tape before. Having your monitor patched into the tape machine will no doubt help you since you'll then be able to anticipate when the sync tone will come by looking at the picture. That vertical sync "boop" is mighty small. At 7½ ips, a 30 millisecond burst of audio uses about ¼" of tape. So you've got to be careful not to miss it altogether. It doesn't matter too much if you clip a line or two at the bottom of the picture, as long as you have a complete vertical sync tone to reset the electron beam sweep back to the top of the screen.

After you've marked the tape at the two spots you want to cut (it's usually easier to put *both* spots on the tape before you cut the tape) turn one of the reels backward by hand to allow the tape to be pulled away from the machine, but leave the tape reels still on the machine. Put the tape into the splicer with the marked spots right over the diagonal cut in the splicing block. Then, cut the tape with the single-edge razor. Don't guillotine the tape – that is, cut it by pushing straight down on the blade, but rather, draw the blade across the tape through the diagonal cutting guide. This way, you are much more likely to keep the angle of cut the same from one cut to the next, and thereby provide a smoother transition from one frame to the next.

If the frame that you have removed from the original tape is one that you want to save, put a mark of some kind with the marking pencil on the tape to indicate the beginning of the frame or the direction of tape travel so that you don't accidently get the tape spliced into the "program" reel

backwards. Unless, of course, you want the tape to be backwards, for a novel effect. More on that later.

Now that the frame has been removed and either saved or discarded, you will probably want to rejoin the two ends of tape that are left dangling from the tape machine. Put both ends into the carved channel in the splicing block and tap it gently into the block. The curvature of the block will hold the tape so it won't fall out. Slide the two ends toward each other until they just touch. If your tape cuts are smooth and consistant, the diagonal edges should mate perfectly. Then, carefully put an inch or so of splicing tape over the cut, making sure that it is lined-up evenly with respect to the edges of the tape. Press the splicing tape onto the magnetic tape and then finish the splice by rubbing it with your fingernail. Now you will have a splice that is almost as strong as the original tape.

After you've gotten the hang of cutting and splicing tape, you might like to try to assemble a "program" or two. You can splice together those pictures that you would show to someone on the first QSO. For example, you could start a program with an ID frame or two, then two or three frames of a picture of yourself, the shack, the QTH, your spouse and offspring and so on. All of this should take about two minutes or so of transmitting time, which is plenty. Don't forget that your final has been working pretty hard for those two minutes. SSTV signals are 100% carrier as far as your rig is concerned. So make sure you don't exceed the key-down limitations for your particular rig.

There's plenty of room for experimenting, too. You don't *have* to edit the tape by complete frames. You could use half of one frame from one shot, and the second half of a frame from another shot to create novel or comic effects. Also, as mentioned earlier, you could splice a frame in backwards – that is, tail end first. I did it once by accident. The picture then comes out upside down. Some guys devise very elaborate programs, "zooming-in" from one frame to the next, giving a kind of motion effect. Another idea is to change the viewing angle of your camera from one shot to the next. This is especially good when you are sending pictures of a person recorded from a "live" camera. All you have to do is select the best frames and splice them together in the sequence that you like.

There is another way that you might take advantage of to edit your tape: tape-to-tape re-recording or "dubbing." If you have two tape machines with "pause" controls, you can do a form of electronic editing by recording only the portions of the original tape that you want to save. This works out OK if you have segments that contain quite a few frames. The technique is similar to the cut-and-splice method: cue the original tape up to the point just before the vertical sync pulse; start the "record" machine, then start the playback machine. After you've recorded the frames that you want, stop the playback machine, then the record machine. You should, however, use tape machines of good quality, since wow and flutter problems only get worse as you dub a tape from one copy to another.

So, some evening when the band goes out early, plan to go through all your DX tapes and remove the bad frames – the ones that got blasted with hetrodynes or noise or miserable QSB, and so forth; first, go through the entire tape to see exactly what it is that you have. If you have a lot of material, it might be a good idea to jot down on a note pad the various scenes that are on the tape. Then, by looking over your "program notes" you can decide what the best arrangement might be for the material you have on tape. You might be able to take on an hour's worth of QSO's and condense it down to just a few minutes. When you've done that, put a label on the new tape so that you know what material is recorded on it. I find that the self-sticking press-apply labels are very good – they're easy to apply and easy to remove.

When you have some good "programs" assembled, I think you will find that people will show a great deal of interest in SSTV. Hams and non-hams enjoy a good TV program. Think of this as your chance to get back at the networks and Madison Avenue!

. . . K2ULR

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Check Logic With This Simple Probe

The beauty of digital logic circuits is in their simplicity. Even though your super repeater function and command decoder may look like something from Star Trek, most likely it is composed of simple AND, OR, NOR and NAND gates. It probably also includes flip flops. The reason I call them simple is that every point in the circuit will be at either a HIGH or a LOW potential. Assuming positive logic, a HIGH will be +5V and a LOW will be 0V or ground potential. In circuit descriptions, a HIGH will be termed a 1 and a LOW will be termed a 0. From this you can see that troubleshooting digital circuits should not be too difficult. The easiest piece of test equipment to use would be a logic probe. A logic probe is a device which gives an indication of 1 or 0. Described herein is a simple, inexpensive logic probe which should cost under $3.00 to duplicate. It uses one Quad Dual Input NAND Gate, the 7400. Two LEDs are used for indicators, one for HIGH and one for LOW. I used a plastic cigar tube to house my probe. It makes a handy probe-sized chassis. I used a nail for the probe point. Power is derived from the circuit under test. Two alligator clips connect to +5V and ground of the circuit under test.

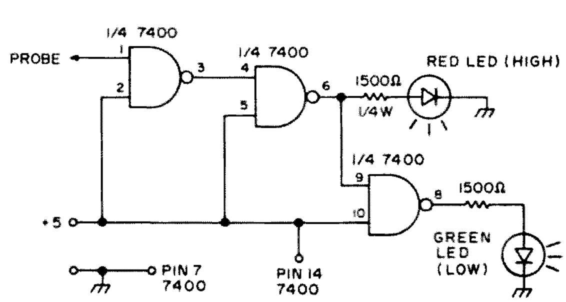

Fig. 1. Logic probe.

As you can see from the schematic in Fig. 1, the logic probe is made up of 3 dual-input NAND gates. A NAND gate will have a LOW output only when both inputs are HIGH. A NAND gate with one input HIGH will act as an inverter and one gate is used in just this fashion in the logic probe. A red LED indicates a HIGH and a green LED signifies a LOW. All wiring is done on a 14 pin DIP socket. Wires run to the LEDs mounted on the wall of the cigar tube. A hydraulic press for cramming the IC and associated parts into the cigar tube is most helpful.

One the logic probe is completed, it is ready to test. Connect +5V to the power lead of the probe and ground the (-) lead. At this point, you should see either the green LED or smoke. If the green LED is lit, touch the point of the probe to +5V potential. The red LED will light. If you do not get the results indicated and find you made a mistake wiring the chip 7400s are available for 29¢ in single units.

To use the logic probe first determine whether a point should be a HIGH or a LOW in a properly operating circuit. Then touch the probe point to the terminal. The red LED will indicate a HIGH and the green LED shows the presence of a LOW. Now that you have a logic probe, there is no excuse for your repeater ID to be on the bench for 2 years.

. . .WA3SWS

Herb Schoenbach W9DJZ
6724 Briargate Drive
Downers Grove IL 60515

Public Service Band Converter

Hear 152-165 MHz on your 2m receiver.

Have you ever been disappointed with the low priced monitor receivers on the market? If so, read on. Here is a simple and inexpensive way to monitor any frequency in the 152–165MHz Public Service Band (PSB). If you have a good 2m FM receiver or transceiver just make a converter to heterodyne a desired frequency to 146.94MHz, or a quiet channel if you prefer. No crystals are needed because the local oscillator will operate at a comparatively low frequency, around 8MHz. You get all the benefits of your high quality receiver such as noise operated squelch, good limiting and AM rejection, good selectivity and near crystal stability.

This won't be a step-by-step construction article. You may use almost any common converter circuit as long as you follow the general outline of Fig. 1. The schematic of the converter I am using is shown in Fig. 2, and is shown as a guide to get you started.

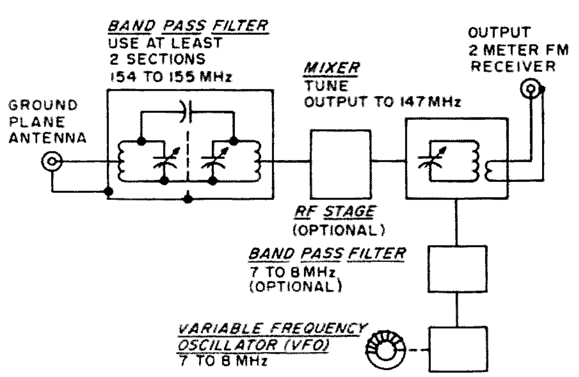

Fig. 1. Block diagram. Frequencies shown are for example only, and may be varied to suit your needs.

As you can see, the circuit certainly is simple enough, but the performance amazed me! Notice the local oscillator tuning range of 7–8MHz. 1MHz is all the range you can tune comfortably. With a vernier dial you can reset it to a previously used frequency even when no station is on, and be sure of hearing it when it does transmit.

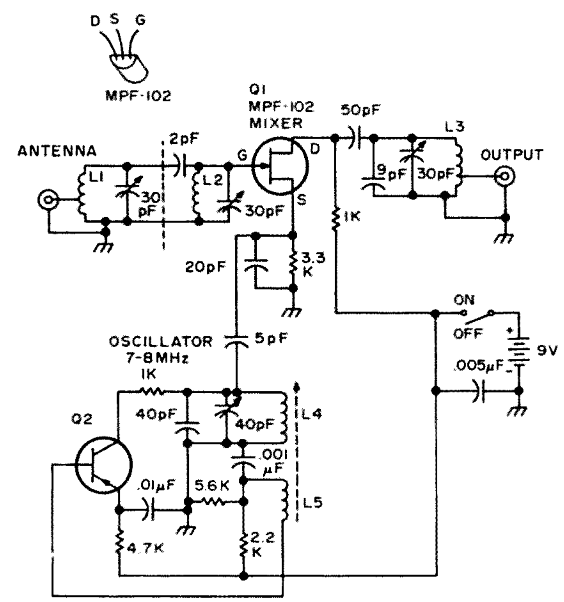

Fig. 2. Schematic diagram. The 40pF variable capacitor should be of good quality; it is the tuning capacitor. The 30pF variable capacitors may be ceramic trimmers, or mica compression type. Q2 is a germanium PNP high frequency transistor. Wind coils as follows: L1, L2 and L3 – 4½ turns #20 bare wire, ¼" i.d., spaced 1.27cm (½"). L1 tap at 1 turn; L3 tap at 1½ turn. L4 – 36 turns #26 enameled wire on 80mm (5/16") slug tuned form. L5 – 3 turns insulated hookup wire (#22) over L4.

No rf stage was needed for full quieting from stations 10 miles away using a ground plane antenna. A double tuned input circuit serves to reduce image response fairly well and i-f feedthrough to a lesser extent. The image in this case is receiver frequency minus local oscillator frequency, or desired frequency minus 2X local oscillator frequency. The i-f feedthrough will be on 146.94 or whatever channel you decide to use. Remember your receiver is now the first i-f stage.

An interesting thing about this set up is that when the desired PSB station is not transmitting, you will hear local (nearby) activity on .94. Unless the .94 signal is much

stronger, however, the PSB station will override. This is where front end selectivity comes in. Personally I like this ability to monitor two channels without a scanner. To get away from this effect, simply select a 2m channel not used in your area.

Interesting thing number two: At one spot on the tuning dial I was able to hear our local weather station KWO39, on 162.55, better than I ever got it before. Another bonus! With a really sharp front end this wouldn't happen but it seems that the second harmonic of the local oscillator brings this in. Getting rid of this "feature" takes a little more doing, like more tuned circuits at the input, a tuned circuit between the local oscillator and mixer, optimum local oscillator injection level, etc. This would take you right out of the simple and cheap class fast.

CAUTION! And this is important. DO NOT TRANSMIT WHILE CONVERTER IS CONNECTED TO YOUR TRANSCEIVER! If you are forgetful about warnings like this, better buy a good monitor receiver instead. One push on your transmit button could burn out the converter and also damage your transceiver.

Just a few more suggestions before you start building. Don't give in to the temptation of trying to cover a large tuning range. 500kHz to 1MHz and a vernier dial is reasonable. If only one PSB frequency interests you, a good quality trimmer capacitor like an APC type will do as the tuning adjustment. You can cover a greater range than 1MHz if you use a tunable FM receiver, of course. For a weather station monitor only, make the local oscillator tune 15–16MHz and tune the front end to weather frequency.

If you decide to design your own converter, or use a standard circuit, keep in mind the benefits of a MOSFET mixer. Use as many tuned circuits or helical resonators in the antenna circuit as needed to get the desired performance. As for a power supply, I use a 9V 2U6 battery. At 3mA I get many, many hours from a battery. For 'round the clock monitoring try to steal the 3mA from your receiver. If you want to simplify still further, try a diode mixer! Good luck.

...W9DJZ

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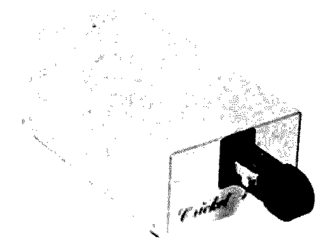

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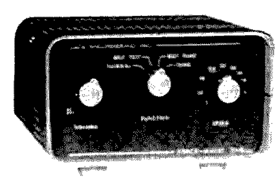

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WILSON
2m FM Transceiver

The basic circuit of the Wilson transceiver has evolved from the Ken unit a year ago to the Henry Tempo FMH – and now it is the Wilson. But there are changes – substantial changes – and all for the better. The Ken was a lot of transceiver for its price, but some amateurs wanted a hotter receiver and wanted a little more poop in the output. The Wilson has a new front end and it is a hot one. It also has a better rear end for more poop on transmit.

There are some other benefits to this rig when compared with other HT's on the market – things like the netting capacitors on all of the crystals, both transmit and recieve. This makes it a lot easier to get the unit right on channel. And all of the crystals are plugged in too, not just some. The earlier Ken units had two channels soldered in – which was not serious where you had a use for both 34/94 and 94/94 – but these days, with no 34/94 repeater in New York, Chicago, Washington, Boston, Los Angeles, etc., that turned out to be a rather serious wasted channel. And in the 34/94 areas, the 94/94 pair wasn't all that valuable. Better that all crystals can be plugged in as in the Wilson. The fact is that a five channel HT with two soldered in channels is a three channel radio.

The Wilson has six channels – and that is none too many in most areas. It is none too few either, for seldom are you inan area where you can reach more than six repeaters with an HT. Considering the size of the HT – and there is more than a little resistance to the larger HT's such as the Unimetrix – more than six channels would begin to crowd things inside so the unit would have to be bigger. You want a unit that is comfortable to hold in the hand – that will fit in the pocket – or on the belt.

Speaking of holding in the hand – one of the really annoying things about most HT's is that if you have any kind of noise level you have to hold the speaker up to your ear and then quickly swing the HT down to speak in the loudspeaker when it is your time to transmit. This little maneuver usually takes longer than the time between transmissions on the repeater, so you are aced out. With some ops you have to be mighty fast of finger to break in and that part of a second it takes you to swing the HT from your ear to your mouth you'll lose out. The Wilson has thymike mounted toward the bottom of the unit, right where your mouth comes when you put the speaker to your ear.

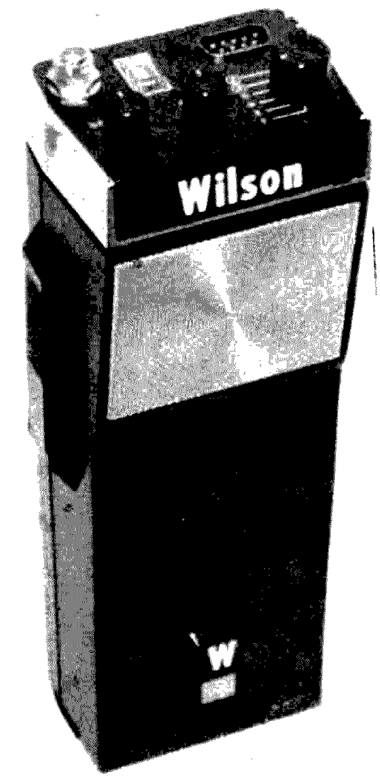
The use of the separate mike (such as you'll find on the late Motorola HT's) results in considerably better audio. You'll find that reports are most gratifying on your audio.

Another big hassle with the Motorola units are those incredibly expensive nicad battery packs they use. The Wilson uses those low cost AA size nicads (you can put in regular AA flashlight batteries in an emergency) – these batteries sell at every Radio Shack or Lafayette store for peanuts – or you can even catch someone like Hal Babylon (advertised in 73) with surplus nicads for a fraction of the Radio Shack price!

When you use your HT on your belt – for instance at hamfests – you want a remot mike that plus into the unit. The Wilson has a plug for this – and it also feeds out the audio fro the loudspeaker which you can hear from a small speaker which is mounted right in the mike case!

The S-meter is handy when you are in a weak signal area and want to peak up a repeater in order to be sure to get the best signal back into it. It doubles as a battery indicator so you won't run your nicads down too far and reverse them. Nicads don't like that.

The circuit board for the Wilson is the size of the case – and this means that everything is easy to get at for servicing. If you've ever tried to fix a Motorola HT-220 you will appreciate the room in the Wilson for work – and the use of small, but not invisible parts.



One problem with the earlier Ken units was a weakness of the internal molded track for the battery pack – it often broke when the HT was dropped – and who doesn't drop one now and then? The Wilson may break if you try hard enough, but it will take an incredible beating before giving up.

Obviously the Wilson is quite a rig – and one would expect it to come through at around $280 or so. Wilson is selling them for only $199 for reasons best known to themselves. It would seem prudent to get one of these radios before the folks at Wilson wise up.

...STAFF

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Tuned Diode VHF Receivers

Test receivers and transfer oscillators.

This article describes tuned dipole receivers from 20 to 500 MHz. I have used them for several years to tune up local oscillators, multiplier chains, crystal oscillators and transmitters. Also included are two "quickie" tuneable oscillators from 130 to 500 MHz, for calibration and transfer purposes.

It is always important to know just which harmonic you're on, and whether you're doubling, tripling or maybe sextupling. These handy pieces of low cost test equipment will tell you.

What will a tuned diode receiver (hereafter TDR) do for you. When you are building a new crystal oscillator, the first thing you would like to know is whether it is oscillating or not, and if so, on what frequency. Also, is it noisy, or maybe even "squegging" (super-regenerating)? In multiplier chains and in transmitters, it is *very* easy to overdrive a base input and what this does to the output sounds real bad. So listen to the output as well as measure it. The TDR will tell you these things and more. It will give you relative rf output power, and how much energy is on the desired frequency.

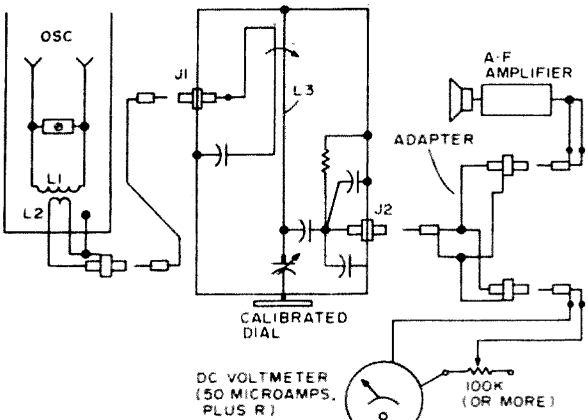

Fig. 1. Test set up. Tuned diode receiver (TDR).

Hopefully you do have a main energy output. I personally have seen an oscillator right here on my own well-worn bench that was putting out almost equal power on one frequency and on the second harmonic. Fig. 1 shows the essential set up. I always have on hand a phono jack with a small L2 attached, plus a 2.54cm (1") wire from the cable shield side of the jack which you can solder the baseboard and hold L2 near, or around, or inside of, L1. L1 may be the output inductance of an oscillator, or other item under test. You can thus move L2 easily from stage to stage of a multiplier as you progress with its build up, and also change the TDR for higher frequency ones as you go. I often use two at the same time, one to watch a lower frequency, the second to see where the multiplier is landing. This is particularly advantageous when the multiplication factor is high, such as a quintupler.

After a while you will find yourself with quite a collection of adapters and probes, cables, plugs, etc. Fig. 2 shows an untuned diode detector unit. This is good for adjusting a tuneable oscillator for maximum power and frequency range. No tuning is needed. It just shows rf power, period. Don't forget, it will show *all* the power at the output, including the sum of all the harmonics too! Such as they are.

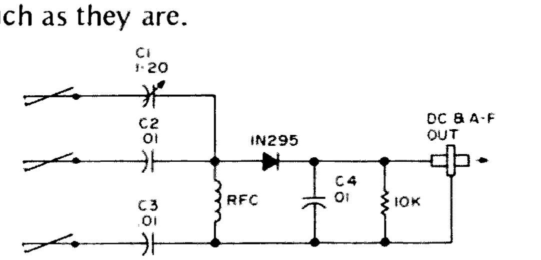

Fig. 2. Untuned diode unit. RFC should be very good and have a lot of inductance to be useful down to kHz range.

Back on Fig. 1 the 100K pot in series with the meter should be calibrated with full scale points for .1V (no resistors), .5V, and more if you wish. Other types of attachments are shown in Fig. 3 with clips, an "antenna" type probe and a loop for magnetic pick up.

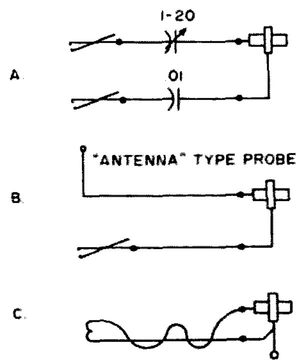

Fig. 3. Rf cable probes.

I also use absorption wavemeters to check on the rf energy. With the TDR meter showing energy either as in Fig. 1 or as in Fig. 2, the wavemeter coil, when resonated against L1, will make the meter dip. If you have a "grid-dipper" it can be used with one or two turns of link coupling around the grid-dipper coil, and over to the oscillator under test via cable No. 1. Use the dipper in the "diode" mode for this test. Most of these, however, do not cover the 450 MHz band.

That about covers operation. Construction of the individual units and the oscillators follows.

Construction

Now I will describe the construction of the tuned diode receivers. For the low bands, these are just plain "crystal detectors" of course, dressed up a little for the purpose of checking oscillators and multipliers, but up towards 450 MHz things get a little different. Fig. 4 shows the 2 to 12 MHz unit. This is useful for 8 and 12 MHz crystal tune ups, and as an AM detector for a 10.7 MHz i-f strip. A very useful one of these is shown in Fig. 5. In the HF range of the unit shown in Fig. 4, practically nothing is critical. A good Q is handy, so I used an airwound coil for L2. Miller coils, which are magnetically shielded as well as electrostatically, are also very good, and their inductance is adjustable by a well made

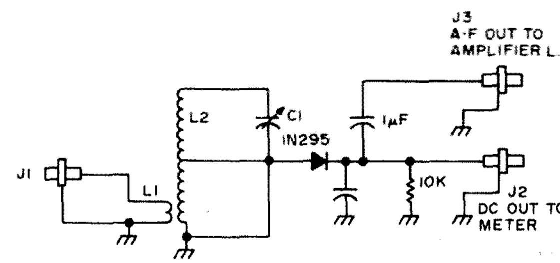

Fig. 4. Tuned diode receiver, 2–12MHz. L1 = 2 turns around L2. L2 = airwound coil, 32 turns per inch, 2" long (not critical) ½" O.D. divide top at center. C1 = about 365pF. For more range use a two gang broadcast job with about 730pF.

positive acting threaded core inside, which helps to set the desired band more easily. The rest of Fig. 4 is very plain. If any 2 to 12 MHz energy is present in the shack, this one will show it on the meter!

Fig. 5 shows (for the benefit of new readers) an outboard i-f stage using an IC, which goes well with the TDR of Fig. 4. It is also useful, of course, for checking to see if you have enough gain in a 10.7 Mhz i-f strip or chip. The Motorola 590 is a compound amplifier in the cascode mode, with very low internal feedback, so no neutralization is needed. And it has a lot of gain too. Positive voltage applied to pin 5 produces very good AVC control, without detuning.

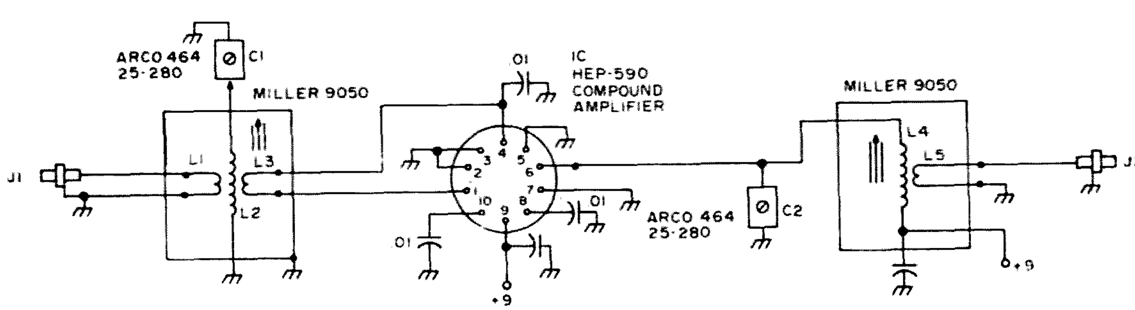

Fig. 5. Outboard 10.7 MHz i-f amplifier for gain checks. Use in front of Fig. 4 for example. L1=3 turns around cold end of L2, L2 = miller 9050, L3 = 3 turns around cold end of L2, L4 = miller 9050, L5 = 3 turns around cold end of L4. Note: open miller coil aluminum shield to wind on L3 and L5.

The TDR for 21 to 75 MHz is shown in Fig. 6, and is little changed from the one in Fig. 4, except for L2, C1 and the tuning range. This one covers the 6m band and most 2m FM receiver oscillators near 45. The extra stage amplifier of Fig. 5 may be also used with this TDR for i-f and rf checks in this range, by changing coils in it to suit. The 590 goes very well on 6m.

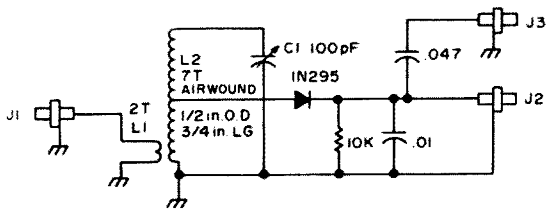

Fig. 6. Tuned diode receiver 21 to 75MHz. L1 = 2 turns, L2 = 7 turns, airwound, ½" O.D., ¾" long. C = 100pF.

TDR for 65 to 130 MHz

This one I use mainly on BC-FM work but you may at any time land in its range while tinkering with multipliers, so here it is in Fig. 7. Again, quite similar to the others shown so far. C1 has a long pointer knob, 5.08cm (2"). Very good also for tuning up "Echo-Listeners." (Little hi-fi FM transmitters for bird-listening!)

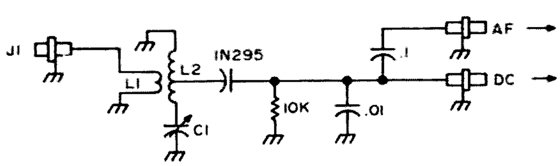

Fig. 7. Tuned diode receiver 65 to 130MHz. L1 = 1 turn, adjustable around L2. L2 = 5 turns no 12 copper, 1" long, 5/8 O.D. C1 = MAC-30 Johnson. 30pF, miniature type.

TDR for 110 to 200 MHz

Particularly useful from 135 to 148 MHz. This one is a little different, using a hybrid trough-line cavity for maintenance of Q up to 200 MHz. Don't be disturbed by the word cavity though. You can cut this one out of thin (or thick) copper-clad and solder it together as a box in less than an hour, as you can see in Fig. 8. The copper face is placed inside the box for soldering together. C1 and L2 are about 3.81cm (1½") from the bottom of the box. Also the same from the top. This unit can be calibrated with a signal

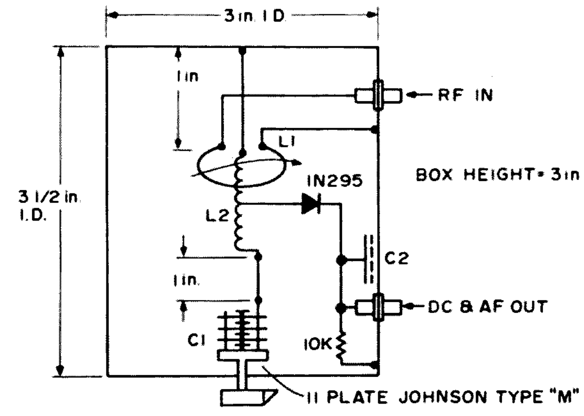

Fig. 8. TDR hybrid through line cavity 100–200MHz. L1 = one turn adjustable per L2. L2 = 4 turns, airwound, 8 turns per inch, ½" long, ½" O.D. C2 = Brass plate, 1" x 2", with .005 teflon sheet and nylon bolts and nuts. Note: C2 can be two or more .001 tiny caps, as in Lafayette catalog.

generator up to around 200 MHz, and for 2m by transmitters in the 2m band, 146 to 148 MHz. It is especially useful from 135 to 148, checking L.O.'s near 135 and transmitters near 147 MHz.

TDR for 160 to 500 MHz

This one is a great help on the 220 and 450 bands. Fig. 9 shows the construction.

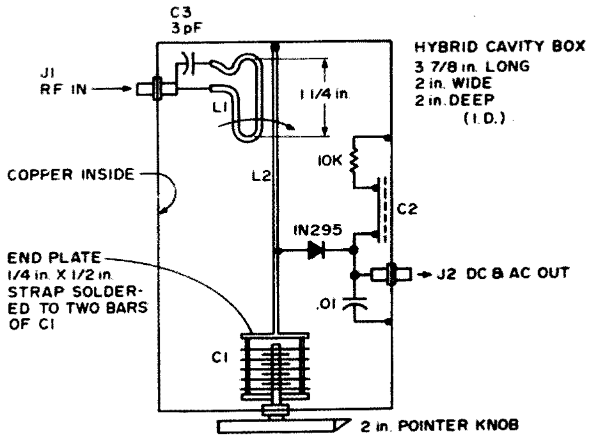

Fig. 9. TDR for 160–500MHz. L1 = Copper strap, 1" wide by 3" long. C1 = 10 plate Hammarlund, type "MAPC" 25 (may also be similar type 25pF of other make). C2 = 1" by 2" brass plate, nylon bolts and nuts. Insulated with .005 nylon or teflon sheet or mica.

Now *this* one calls for a little attention to *shape* and special work, because 500 MHz is getting up towards microwaves where everything really changes radically. L2 is now a

straight strip, and C2 must be especially made of a brass plate with insulation of nylon, teflon, or mica. Nylon nuts and bolts also must be used. L1 should be semi-adjustable, and the 3pf series capacitor helps to match the test cable into the unit. A 1-10pf variable for C3 will provide an even better match. C2 takes care of 500 MHz bypassing, and the 10k resistor and the .01 on J2 provide a reasonable af time-constant for demodulating AM signals.

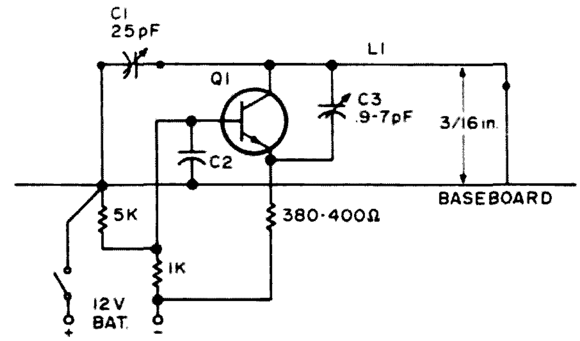

Fig. 11. Schematic calibration oscillator 130–500MHz.

Calibration

This gets to be more of a problem. So, I have built up a very low cost and simplified test oscillator for the range 160 to 500 MHz, which is shown in Fig. 10 and Fig. 11. There are sufficient notes on these figures for construction. Do not rely on a sensitive receiver for calibration. Use an absorption wavemeter, or a "dipper" in the diode mode. A buddy with a 432 signal also helps. Once the oscillator is calibrated, you can transfer the calibration to the TDR easily. You can build two oscillators, or do your TDR calibrating on the 200 to 500 MHz range first, and then change L1 to the lower range, 130 to 200 MHz.

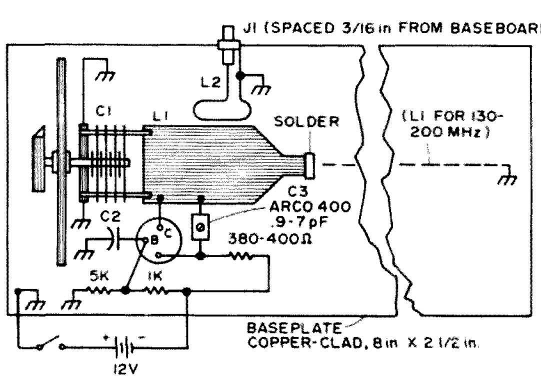

Fig. 10. Pictorial layout calibration oscillator. For 130 to 200MHz, L1 is ¼" "STRAP, 5¼" long, from bar ends of C1 to soldering point on baseboard. For 200 to 500MHz, L1 is 2-1/8" from the ends of bars on C1, to the soldering point on the base plate. (1) Transistor Q1 is a 2N3600, 918 or similar UHF device. (2) Note that the base plate is at 12V+. C1 is MAPC Hammarlund 25pF or similar of other make. Be sure and make two short connections to ground from the rotor.

Conclusion

A set of tuned diode receivers (TDR) has been described to help you with tuning up of multipliers, L.O. units and other transmitters. I use them constantly here, and you too may get to like them.

. . . K1CLL

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FINDING THE HEIGHT OF A TREE, POLE, OR TOWER

Many times it is necessary to know the height of an already standing pole, tree, or tower for antenna raising purposes. Climbing the pole or tree to measure its height can sometimes prove difficult as well as dangerous; however, there is a much easier way to find the height. By using the laws of similar triangles, it is quite easy to derive the height of the pole or tree in question.

Wait until the sun is in such a position as to cast a nice shadow of the pole or tree along the ground. Now measure the length of the shadow of the pole or tree in question. Next stand another pole of known height (such as a 5 or 10 ft TV mast) in the sun and measure the length of its shadow. By using the following formula, the height of the pole, tree, or tower in question can be derived.

$$\text{Tree height} = \frac{\text{TV mast height} \times \text{Tree shadow length}}{\text{Length of TV mast shadow}}$$

. . . WB6NWW

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The Automatic SWR Computer — Part II

Digital readout of your SWR.

Last month I began the description of a special purpose hybrid computer that a ham could construct to read out his SWR. The builder has the option of using a panel meter readout or a digital readout. This article concludes the instrument with a description of the A/D converter and display. Even if the readout isn't desired for the SWR computer, it could be built as a separate module for various other uses around the shack.

This portion of the computer which is actually a digital voltmeter is different from most types that hams are familiar with. It is a tracking A/D followed by a binary-to-BCD converter and display. There is no inherent low frequency updating to display a new value. The display follows the changing analog input instantaneously. This speeds up the tuning procedure since the operator doesn't have to wait for a lagging display to catch up to his tuning change.

I do not have a PC layout available for the digital portion. I mounted the ICs on a half of a standard DIP board and wired the ICs point to point underneath with #22 formvar wire. The 3 LED numerical displays were mounted in DIP sockets which were fastened on end to the DIP board with 2-56 screws.

Circuit Description

Fig. 1, is a schematic of the digital portion of the computer.

The voltage output from the analog computer is buffered by U4. The D/A converter (DAC) U22 is part of the tracking A/D converter. The input voltage from U4 is compared with the DAC output voltage by comparator U5 which generates a count-up or count-down directional command to the up/down counters. The binary counter outputs are D/A'd by the DAC and compared with the analog input voltage. The feedback within the loop is such that the error voltage seen by the comparator dithers about zero by an amount equal to ½ LSB of the D/A. Therefore the outputs from the counters is a binary coded representation of the analog input. One half of U13 is used as an oscillater to provide the internal clocking. The counter outputs are inverted and fed to a 9 bit binary to BCD converter (U9, U10, U11, U14). The LSB output from the counters is dropped so that the display will not dither in the last digit. The BCD outputs drive 7 segment decoders and finally the 3 digit LED display.

The DAC used in the readout is made by Precision Monolithics, 1500 Space Park Drive, Santa Clara, CA 95050. You can contact them for their nearest distributor to you. The IC number is A1MDAC-100CC-Q1. In addition to the ±15V supplies, a 5 VDC logic supply at 1A is needed for the digital display. A bridge rectifier and an LM309K regulator were used in the prototype.

Alignment

The alignment is pretty straight forward. The input to U4 is grounded and R55 is adjusted to give 0.00 on the display. Then 8VDC is applied to U4 and R54 is adjusted to give a reading of 8.00. The steps may have to be repeated a few times until consistant results are obtained.

The measured linearity of the completed converter and display was better than .1% over a 0 to 8V range. All that remains is to connect this module to the unit described last month and you will have a first rate SWR computer. SWR's as high as 8.88 can be displayed. (If your SWR is higher than that you're probably tuning by nulling the temperature of your coax anyway).

. . . W6OTG

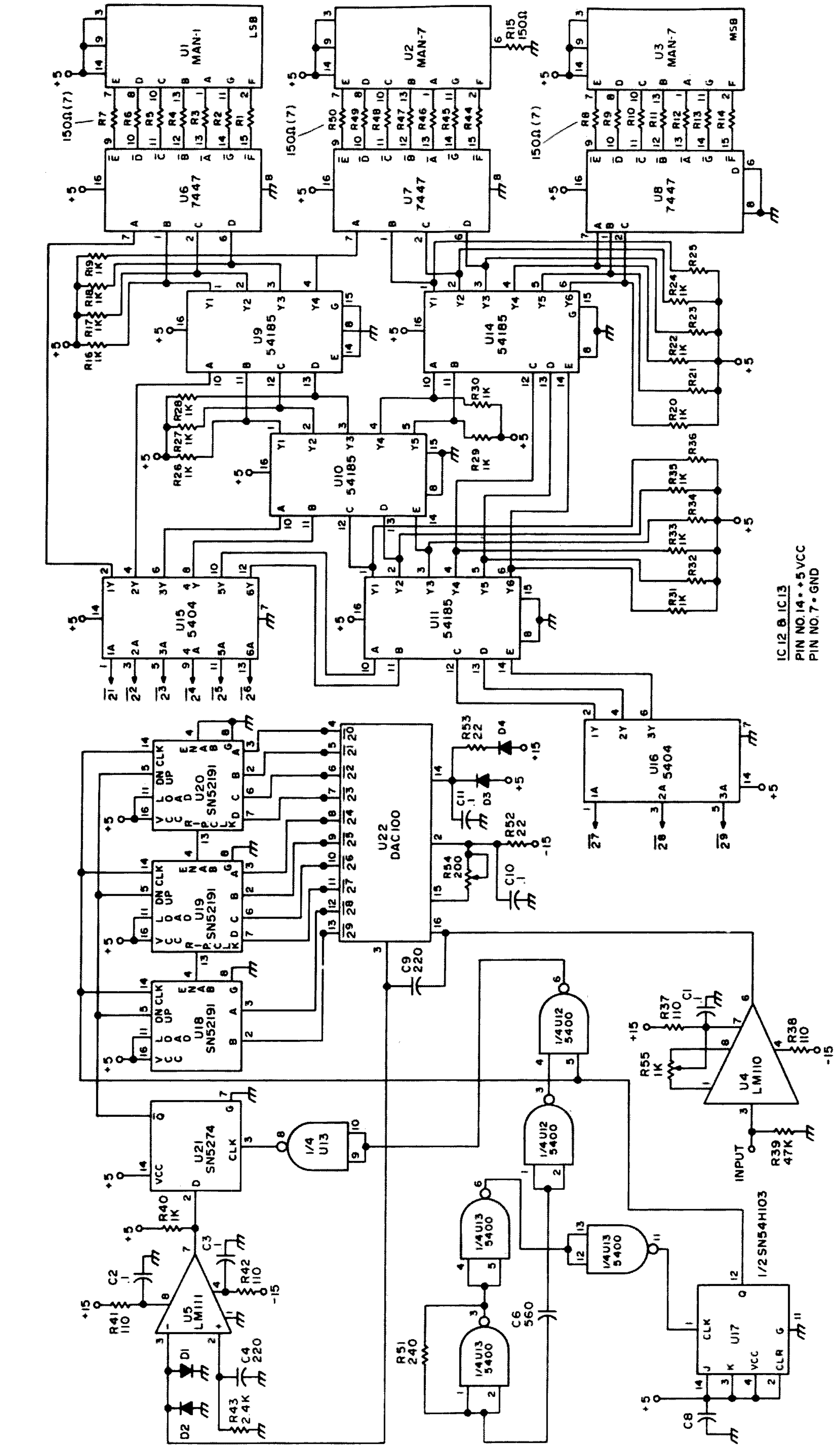

Fig. 1. Digital computer section tracking A–D with display.

Power Pole — The El Cheapo Tower

Poles may be available for the taking.

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Nampa ID 83651

If you have to choose between a good beam antenna and high power, take the antenna. We have all heard that sentiment expressed many times, and most of us hams believe it, but a lot of us are still putting up with a 40m inverted vee 7.62m (25') high in the middle and 3.05m (10') off the ground at the ends. One of the constraints holding back many from installing an antenna system that is really efficient is the cost of the tower. A guyed steel tower will run $200 to $300, and a self-supporting one can set you back anywhere from four hundred dollars to well over a thousand. Sometimes a person is lucky, and buildings or trees will be located just right and sufficiently high enough to serve as adequate supports for a superior antenna installation, but most of us have to provide our own means for supporting antennas.

In my case, I wanted to have a two element tri-band quad for 20m, 15m and 10m at 21.34m and a multiwire inverted vee system for 80m and 40m with its center at 19.82m (65') or so. I felt that these heights would be the minimum for the really outstanding antenna performance that I wanted. The angle of radiation from the quad would be sufficiently low to produce superior results with DX, and all the antennas would be adequately clear of surrounding power lines, houses and trees.

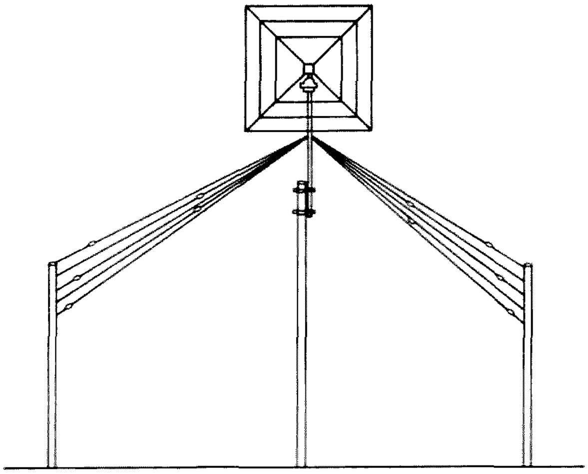


Fig. 1. A 60-foot power pole with a water pipe extension is used to support the quad and the center of the multi-wire inverted vee doublets for 80 and 40 meters. The ends of the doublets are attached to the 40 foot poles.

Availability of Power Poles

A look at the prices quoted in tower catalogs and ads quickly convinced me that a solution other than a commercial tower would have to be found. The thought then came that I had heard somewhere that used electric power poles could be obtained very inexpensively. When I asked a local power company official about the possibility of getting a pole, he told me I could have one for no cost if I could haul it away from the site at which it was removed. Poles having many years of useful life are occasionally taken out of service when highways are widened, new buildings erected and the like. Unless the power company re-sets these poles in the ground at another site almost immediately, the part underground will deteriorate badly when the pole is finally re-used. For this reason the poles are free for the taking, but they must be re-set quickly if they are to last well.

After a further planning session I decided that what I needed was one quite long pole in the 18.29m – 24.39m (60' – 80') class to support my quad and the center of the inverted vees, and two 12.20m (40') poles for the ends of the inverted vees.

Moving The Poles

Almost immediately two 12.20m (40') long poles became available just three blocks away from my house. The short distance

involved simplified the transportation problem. A chain was wrapped around one end of the pole. Then each pole was dragged in turn with a truck the short trip home. This simple method is not recommended if the poles must be moved more than a few blocks. The wear produced on the surface being dragged might be enough to damage the pole. Also there is some risk of damaging street surfaces, especially if they are asphalt.

Some weeks later I was notified that a 18.29m (60') pole could be mine if I would haul it away during the next two days. This one was about two miles from my house, and much heavier than the 12.20m (40') ones. I had thought they were big, but this new one made them seem like ordinary fence posts. The butt end was at least 45.72cm (18") in diameter, and 18.29 (60') really seemed long all laid out on the ground. Dragging with a chain for two miles would never work. After enlisting the help of a friend with a small truck and scrounging up a set of small wheels on an axle, the possibility of actually moving the pole began to seem more in the realm of probability. Fortunately, the pole was located only a block from a small manufacturing plant where I was well acquainted, and I was able to engage the free services of a fork-lift truck and operator for a few minutes. With the fork lift, the heavy butt end of the pole was lifted up onto the truck bed and chained into place. The lighter end of the pole was lifted and the set of small wheels and axle were chained into position under the pole about 4.57m (15') from the small end. After affixing a red flag onto the trailing end of the pole, all seemed in readiness for the move. About this time I noted a police patrol car parked a half block away, and I realized that if he were not already interested in our activities, he undoubtedly would be as soon as we started to pull our 18.29m (60') monster out into the street. Firmly believing that the direct approach is best, I walked down the street to his car and asked his opinion of our proposed expedition. To my surprise, he seemed only mildly concerned about our activities and declined my invitation for him to escort us through the traffic in the two rather heavily traveled intersections that lay just ahead. He seemed content merely to admonish us to be sure we had a red flag on the end of our pole. So, with his statement that the power company people move poles like mine all the time, we parted. As I thought of the behemoth pole, I just hoped his confidence in us would be justified.

The trip began quite successfully. Before long, however, we realized that we had a serious steering problem. The wheel-supported end of the pole had a disturbing tendency not to follow the truck, but to swing dramatically to the right or left into the next lane of traffic. This problem was solved when friend Merv suggested that he ride the pole just behind the wheels and steer them with a rod inserted into the axle mechanism. With considerable attention from curious onlookers, we made the two-mile trip and finally deposited the pole in the alley alongside my back yard.

Erecting The Poles

Before erecting a power pole you need a hole. How deep should it be? A depth equal to 12 to 13% of the total pole length should be about right. Or, if you prefer, simply match the depth used by the power company on your particular pole. Although the power company has beautiful power-driven augers which can produce a neat-looking hole in minutes, I had to resign myself to a few hours with a shovel and a hand-operated posthole digger. Surprisingly, the hole for the big 18.29m (60') pole went faster than did the ones for the 12.20m (40') pole, mainly because it was large enough in diameter to allow me to get down into the hole itself.

Because of their varying sizes and locations, a different approach was used for erecting each pole. One of the 12.20m (40') poles which was in an easily accessible spot was lifted and shoved with a large forklift truck until the big end began to slip into the hole. While the pole was supported temporarily in this position by another vehicle, the forklift was pulled away from the pole,

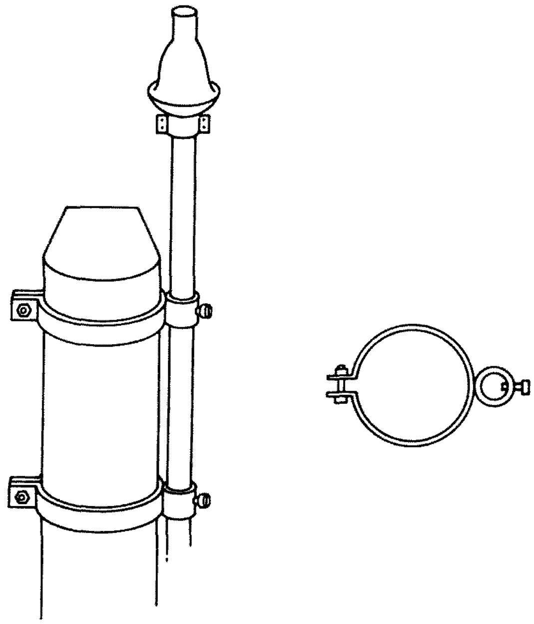


Fig. 2. The water pipe is not pulled up to full height until after the rotator and quad are mounted. To the right are the clamps used to fasten the pipe to the pole.

and while the forklift prongs were in their highest possible position, they were re-chained loosely to the pole. The shoving process was repeated until the pole dropped into its hole.

The hole for the second 12.20m (40') pole was located in a more awkward spot. To erect this pole, we used a truck having a large tripod and chain hoist mounted on the rear end. The pole was picked up near its center of gravity, a point about 4.57m (15') from the heavy end. Once the center of gravity of the pole was 4.57m (15') in the air, the pole was rather easily swung into an approximately vertical position and dropped into its hole.

Forklifts and tripods on the end of a truck are just not suitable for a large 18.29m (60') pole. Fortunately I have a friend in the construction game who has a large crane. He volunteered after some hinting from me to send his crane over one Saturday morning to do the job. For the first time, my 18.29m (60') pole seemed light and small. Once in position, the crane had the job done in five minutes.

Make sure the pole is really vertical before re-filling the hole with dirt. If the pole is not perfectly straight, position it so that the center of gravity of the part of the pole out of the ground is directly over the hole. Be sure to stamp the dirt in thoroughly when replacing it around the pole. People who know say not to use concrete to refill the hole. Dirt is better.

I must admit that a power pole is not an attractive object to most people, but after investing as much thought, time and effort as I have in securing and erecting mine, they have taken on a very special rugged sort of beauty.

Extensions

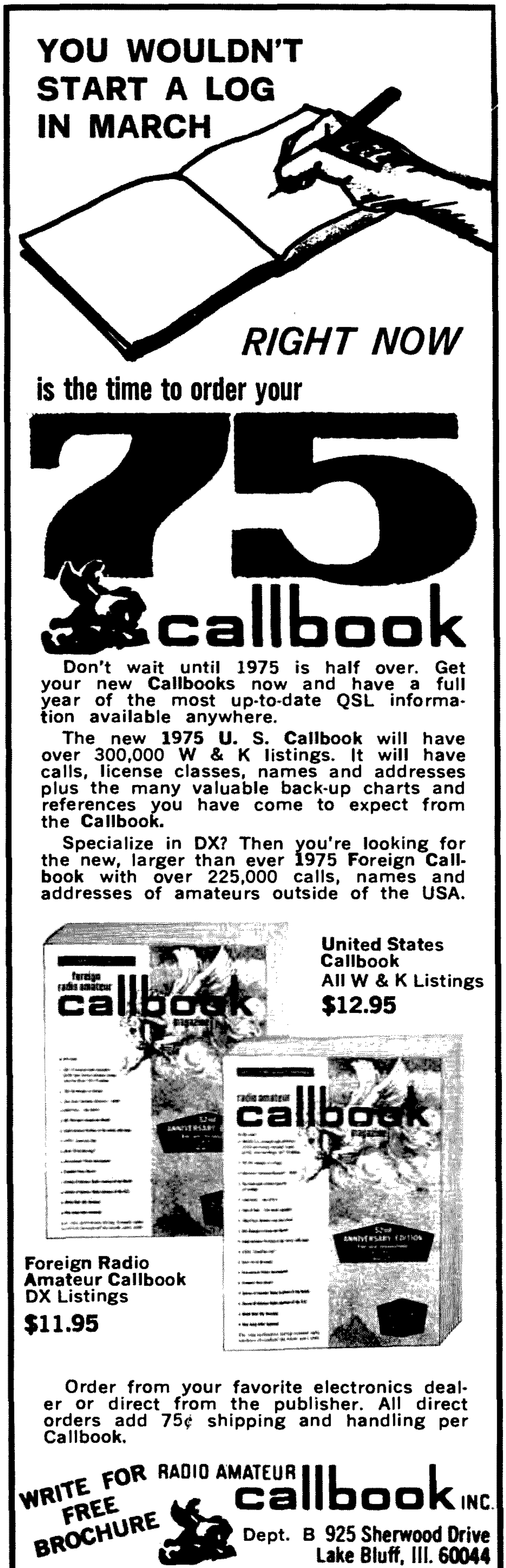
As you remember, I originally started on my antenna support project with a goal of a minimum height of 21.34m (70'). A 18.29m (60') pole with 2.13m (7') in the ground leaves only 53 feet. My solution for getting up to 21.34m (70') was to extend the power pole with a 6.40m (21') section of 3.81cm (1½") I.D. galvanized water pipe. An overlap of a meter or so (several feet) between the pipe and the pole still allows for a total height of 21.34m (70'). Clamps were used to fasten the water pipe to the pole.

Climbing The Poles and Installing The Antennas

Access to the tops of the poles is easy if you have a pair of climbers and know how to use them. I had the climbers, but I didn't know anything about using them. Luckily my good friend, W7PSC, is an expert.

First, a small pulley was fastened to the top of the tall center pole. A small rope through this pulley was then used to pull up, one at a time, the pole clamps, water pipe, rotator, quad and finally, the 80m and 40m dipoles. The quad and rotator were mounted on top of the water pipe, while the pipe was in a lowered position in the pole clamps. The small rope was then tied to the bottom of the water pipe and the pipe-rotator-quad assembly was pulled further up and clamped in position.

Since the three poles are not quite in a straight line, the two legs of the inverted vee dipole system can act as two of the guys of a three-guy system. The third guy is a stranded galvanized wire running off in the appropriate direction.



Results

Some unsympathetic onlookers may question the wisdom of your owning your own private electric power poles, but don't let them bother you. Power poles make a sturdy, inexpensive antenna support system, and a good set of antennas will improve the performance of your station more than any other factor. This fact has been made quite vivid for me recently during three-way contacts in which another local ham and I have asked DX stations to compare the signals of his 1000W transmitter feeding a vertical at an average height with the signals from my 100W to a two-element quad at 21.34m (70'). The low power station has always received the better report. Get a good antenna up in the clear, and you will be pleased with the improvment in your signals.

. . .W7OXD

QSL-STK

One of the problems facing hams on the move is what to do with old QSL cards after resuming operation at a new location. After a recent move to a new QTH, I found myself with several hundred perfectly good, yet inappropriately addressed QSLs.

The problem was solved with the aid of self-stick labels obtained from an office supply store. The ones I used were intended for file folders, but they come in a variety of shapes and sizes. The label was used to cover the old QTH, while the new address was rubber-stamped over it. The result was a neat card that had the appearance of being printed. This allowed me to exhaust my existing supply of QSLs, as well as tide me over until new ones arrived.

Even if no move is in sight, there is a good possibility that QSLs printed with the home QTH could be altered in this manner for operation from vacation tops or mountaintops during field day. The rubber stamp, by the way, has numerous uses around the shack, such as for correspondence. The self-stick labels are also great for marking ownership of gear that might be loaned out.

. . . K1YJC

Hamshack Goody from Housewares

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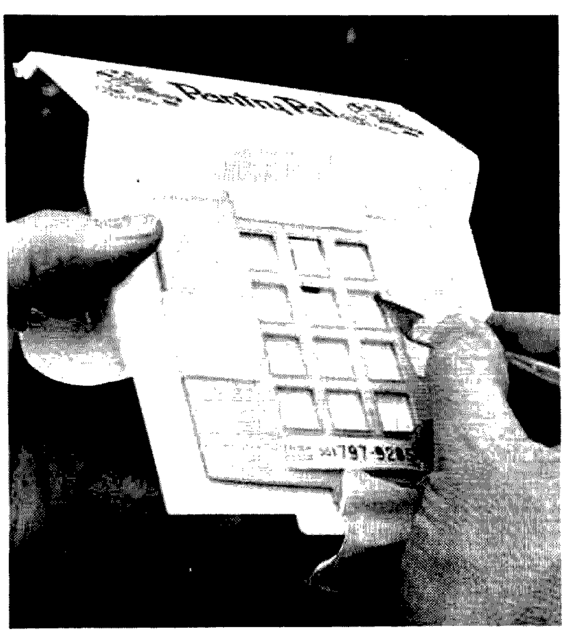
Hagerstown MD 21740

Installing a touch-tone pad in a 2-meter FM mobile or fixed station setup (for autopatch or repeater two-tone access) is often quite a chore. Not only are small metal boxes difficult to locate and expensive – cutting those 12 little square holes requires extreme care and patience, if a neat mounting is to be obtained. Spending hours with a drill and file is not my idea of an ideal evening, especially when one goof means a botched job.

However, one recent day while wandering through a local store pretending I was going to buy something (when I was actually looking at bra-less YL types in skin-tight hip huggers), I found myself in the kitchen wares department.

This not being my usual environment, I was surprised to find a whole counter full of potential TT pad boxes – and in quite a variety of sizes and shapes! Albeit, these boxes are constructed of plastic, but because of this they are easy to cut and above all they are cheap! A slight error is of minor concern – just throw that box away and start on another!



For example: 10 of the quart size refrigerator and freezer containers can be obtained for slightly less than two dollars. These are readily adaptable for use as a TT pad mounting on a handie-talkie. Another item, a "Recipe Box" makes a dandy sloping panel box for mounting a pad to be used on your operating table. These sell for about a buck.

To assist in laying out the 12 hole pattern on the plastic container you have selected for your project, disassemble the nearest telephone and utilize the Western Electric Touch Tone cut-out as a template for marking. Your felt tip pen works fine for this. Then, with an X-acto knife, scribe a light line around the perimeter of each opening. Keep retracing each line, going deeper each time, until the opening is cut through. Any lettering on the plastic boxes can be removed with solvent.

...W3WTO

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Charleston SC 29412

Wheeling and Dealing at Hamfests

Get rid of it!" She had said this before, but now her words had the ring of authority. I will have to admit that there was beginning to be reason for my wife's concern. The garage was getting rather full. It was bad enough when we could not get the Cadillac in, and worse when the Volkswagon would not fit, but now that my son is complaining about having to leave his Honda outside, I suppose it is time to do something about getting rid of it.

She was talking about my wonderful collection of radio paraphernalia, including receivers, transmitters, Teletypes, generators, coax, box after box of tubes and parts, all carefully hoarded after many years of endless scrounging.

I reluctantly agreed with my frustrated XYL that we must get rid of it. There was nothing left to do, except pack it up and take it to the Shelby Hamfest.

Getting ready for the trip was not as easy as I thought it would be. I had the Volkswagon half loaded with goodies when the XYL came to check on the progress.

"What do you think you are doing?" she shrieked when she saw what I was doing.

"I am loading the Volkswagon with this stuff you call radio junk." I offered meekly, since I knew what was coming.

"You are not going to get rid of anything by loading the Volkswagon, load the Cadillac!" she insisted.

"If I load the Volkswagon, we can at least get the Honda in the garage," I volunteered half heartedly.

I unloaded the Volkswagon and began loading the Cadillac. What to take? I suffered a thousand deaths as I tried to decide what to part with.

I finally gave in, and jammed everything I could into the car and then called the XYL for a last minute check of my progress.

She grinned from ear to ear, and an evil looking grin at that, when she saw the wide open spaces left in the garage.

"This is wonderful, now Junior can get his Honda in the garage again," she exclaimed and then added, "Perhaps we can even find room enough for the Volkswagon."

"Uh huh," I muttered unintelligibly. I did not have the heart to tell her about the 17 Teletype machines I had bid on recently at a surplus sale. I wondered where I was going to put them, but now there was plenty of room in the garage.

The XYL inspected the car carefully and found a roomy gap in the back seat. Before I knew what was happening she was emerging from the garage with another item that she tucked neatly away into the extra space.

I started to explain to her that this was my war surplus 2300 MHz antenna tuner, and you just didn't find those anywhere. I knew however that she did not understand about such things, and I also knew that she was determined to get rid of it. Besides, I rationalized, I was having trouble getting on 2m, let alone 2300 MHz, so I let it go into the car with the other goodies.

About halfway to Shelby a highway patrol car pulled along side with his blue light blinking. I wasn't speeding so I was naturally concerned about why the patrolman was stopping me.

"What have you got in the trunk?" he demanded.

"Radio equipment," I responded meekly.

"Open it up!" he ordered gruffly, as though he didn't believe me.

When his inspection revealed only the radio equipment, he explained that they had been having trouble with some bootleggers, and he thought my car was too low to the road, so he expected that it might have been loaded down with booze.

I couldn't resist telling him that I knew a few bootleggers but they were not the kind he was looking for.

"Say, what are you going to do with all of this stuff," he asked.

I explained about going to the hamfest, and that I was going to trade or sell it there.

"I sure would like to have a good radio like that," he was pointing to the antenna tuner. "A friend of mine, Dennis, has a ham rig and he tells me that it is a lot of fun." He continued, "Do you happen to know Dennis?"

"Sure everyone knows Dennis," I replied. "If you want a good radio I could sell you this one," pointing to an old black BC-348, for $50.

He looked at all of the knobs, and I could tell that he was impressed.

"It's a deal!" He pulled out his wallet, and handed me a fifty.

As I drove off, I chuckled to myself. It was the first time I had ever been stopped by a cop, and collected money. I had a feeling right then that this was going to be a great hamfest.

Finally arriving at the site, I sought out and found an ideal spot to spread out all of the items I had brought along.

Even as I unloaded, groups of curious hams began swarming around the car to inspect the goodies. I heard one fellow remark, "It has been years since I have seen anything like this stuff."

Among the items were a BC-653, a BC-733, a BC-105, ten BC-604s, a BC-432, some BC-221s and ten boxes of tubes, mostly 807s. A young fellow asked if the BC meant Before Christ. When I put the TCS-12 on the table the car was empty.

I ignored the wisecracks from curious onlookers, who seemed determined to heckle me about the vintage of my stuff. Despite this heckling I managed to sell a couple of ARC-5s before lunch time. I had to admit however that business was not as good as I expected.

It was obvious to me that hams nowadays did not appreciate this fine old equipment. Old timers would stop and comment on the good old days. They complained about how they didn't build equipment like that anymore, but they didn't want to buy any of it.

About one o'clock a fat little fellow walked up, grinning and shaking his head as he inspected the assortment of goodies. He took me by surprise when he said, "I'll give you $200 for everything you have."

"Two hundred dollars for all of this stuff. Why it must be worth at least $2,000" I responded in a hurt tone.

"Maybe, but how much of it have you sold," he countered.

I thought about this for a moment, and also about having to face the XYL if I carried it all back home. This was better than nothing, and besides I needed that space in the garage for my new Teletype equipment.

But to part with all of those wonderful treasures for a measly $200. It was unthinkable! Nevertheless I thought some more about listening to my wife's greeting and about loading all of the stuff into the Cadillac again. It didn't take long. Looking the man straight in the eye I announced, "It is yours."

With the stuff sold I was able to look around and see what everyone had brought for sale or swapping.

I almost bought a BC-610, but I gave up the idea when I couldn't figure out how to carry it home in the car.

Suddenly something attracted my attention. It was a sign with the words hastily scrawled: *GREAT CONVERSATION PIECES: HARD TO FIND EQUIPMENT: REASONABLE: BUY WHILE YOU CAN.*

Whoever it was had a great attraction, people were crowding around pushing and shoving to get a better look. I finally got close enough to see what it was. There was the little fat man selling my equipment. The people were not just looking they were buying and the man did not have very much left.

I grumbled to myself, "Conversation

pieces, huh. Well he might be right," and I thought of the conversations the stuff had inspired between the XYL and myself. "I wish I had thought of the idea myself," I muttered.

"Hard to find, baloney!" I kept on mumbling. "I still have two thirds of a garage full. Just wait until next year."

I was really disgusted about the whole thing and took off for home.

I kept thinking about being outsmarted and I did not have my mind on driving.

About halfway home, as I thought about the deal for the 101st time, a blinking blue light attracted my attention. All at once I realized that he wanted me.

I pulled over, and my friend from earlier in the day pulled along side.

"You know you were going 10 miles over the speed limit," he announced with a very friendly smile.

He had obviously recognized me, and I felt easier until he continued.

"The Judge will charge you $5 a mile for each mile per hour you were over the limit," he informed me.

"You can come to Court Monday night, or you can give me $50 as a bond and go on your way." He kept grinning all of the time.

I pulled out the fifty, handed it to him, and bid him politely goodbye.

All the way back, I kept wondering to myself, if that patrolman wound up with a free radio.

Carl C. Drumeller W5JJ
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Listener-Designed Speech Filters

The USAF, at its Cambridge Research Laboratories, has made a thorough study of the effect of speech filters upon intelligibility. Some of the findings are just what one would expect from one's amateur radio experience. Some, though, are not.

The effect of a speech filter varies directly with the bandwidth used by the transmitting system. If the bandwidth is 6 kHz, the improvement in intelligibility may be as much as 10 dB, with about 6 dB more commonly realized. As the bandwidth is narrowed down, the filter becomes less effective, dropping to 1 dB increase in intelligibility when the bandwidth is 2 kHz. At 3 kHz, which is about the maximum used in amateur SSB transmission, an advantage of 3 dB can be obtained.

This may not sound impressive, but 3 dB is just what you'd gain by doubling your power output; so perhaps it's more impressive when thought of in such terms.

The responsive curve found to give best results is one that produces a 3.5 dB per octave boost, starting at 500 Hz. On the low-frequency end, there's a similar boost between 500 Hz and 200 Hz. One somewhat astonishing finding is that speech processing should occur *before* any limiting or compression. Not astonishing, though, is the conclusion that the transmitter should be modulated to its peak capability by the peaks of the signal at the output of the filter.

Another conclusion which runs contrary to general thinking is that filtering at the receiving end is not effective. In fact, it may decrease the intelligibility. This conclusion runs parallel with the findings of a previous study which came up with the amazing report that maximum bandwidth and maximum intelligibility ran hand-in-hand! So revolutionary was this finding that it was quietly disregarded, with the hopes that it would soon be forgotten.

. . .W5JJ

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RHOMBICS - Are They Really Worth It?

Every amateur always wants a little bit better antenna than the one at his present installation. Occasionally, he will think that a rhombic would really fit the bill, if only there were enough space, height, etc. After thinking about this for a time, he looks over what reference material there may be immediately available, then goes about his business to think about antennas another time.

Many amateurs, SWLs and others think of the rhombic as the Rolls Royce of antenna systems, the absolute ultimate, or the panacea for the problem of elusive DX. It is unfortunate that more information on this antenna is not more readily available to the average person. The *ARRL Antenna Book* contains some information, as does the E&E *Radio Handbook*; but substantive information is usually available only in exotic sources and when located is often in such terms as to be unintelligible to anyone without an EE degree.

Confronted with the choice of antenna structure to erect on my 5½-acre QTH, I

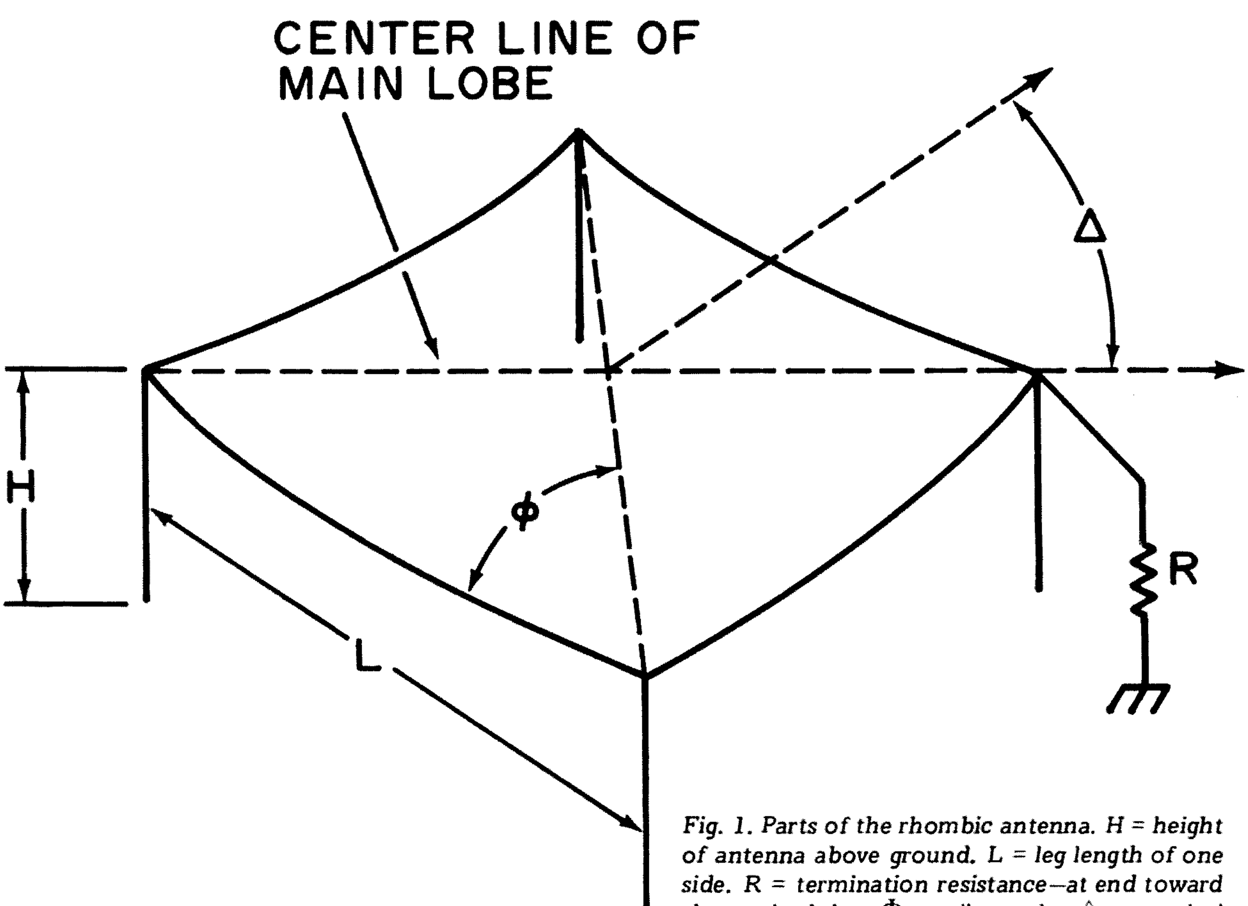
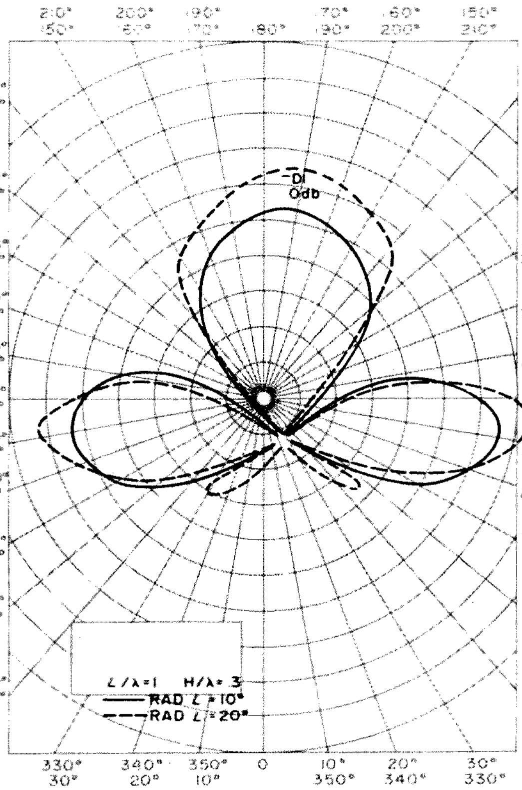
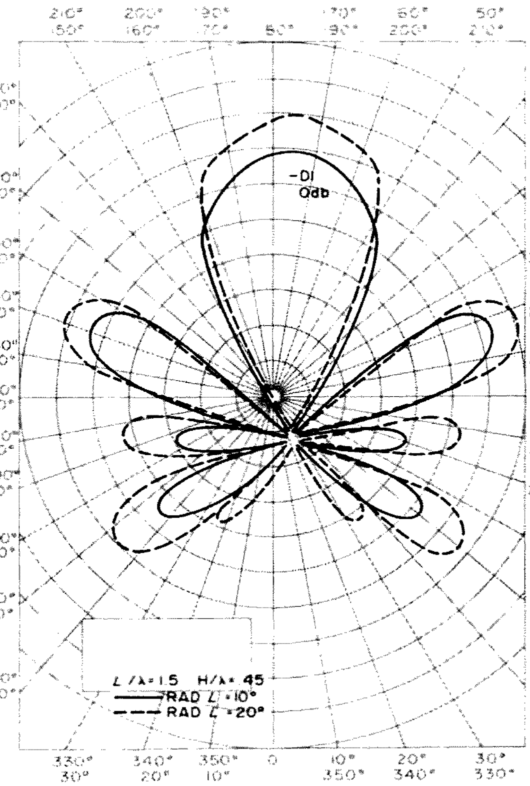


Fig. 1. Parts of the rhombic antenna. H = height of antenna above ground. L = leg length of one side. R = termination resistance—at end toward the main lobe. Φ = tilt angle. △ = vertical radiation angle.





considered a number of different designs, including the rhombic. It was confusing to see terms such as *tilt angle*, not the tilt of the antenna in respect to the ground, but the "tilt" of the geometrical figure in relation to a square – a tilt angle of 45° would result in a square; 0° and 180° would produce a straight line, see Fig. 1.

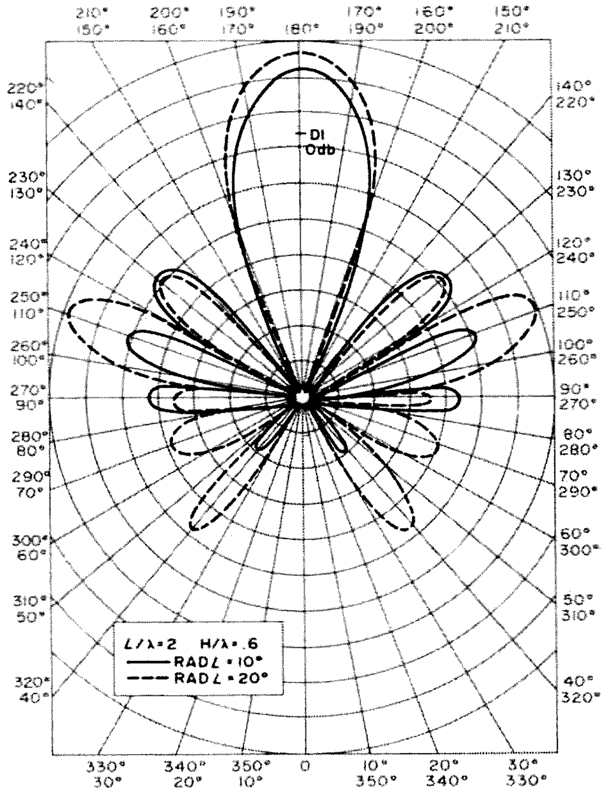
H = height of antenna above ground
l= leg length of one side
Ø = tilt angle
R = termination resistance – at the end toward the main lobe.
△ = vertical radiation angle

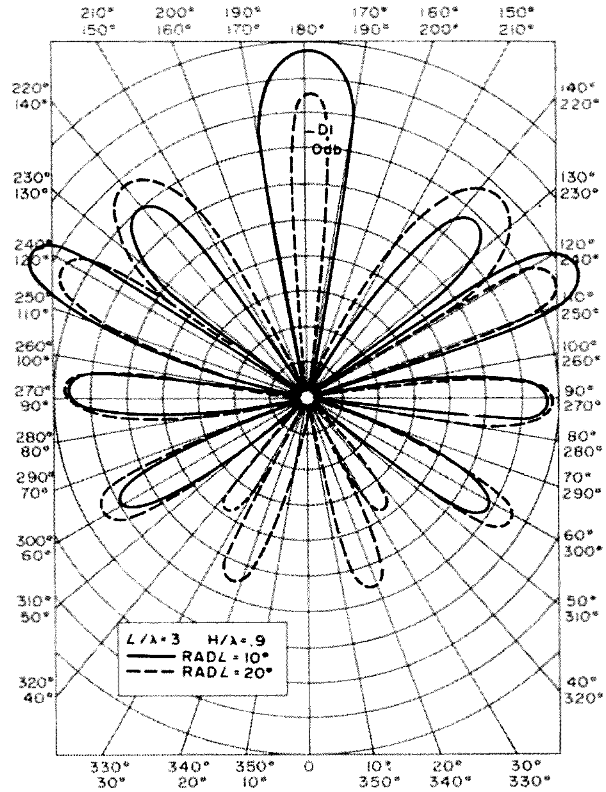
This information, coupled with complicated mathematical calculations immediately discourages all but the most determined of the fraternity. It is possible, fortunately, to calculate theoretical radiation patterns for a given set of parameters; we'll get to these in a moment.

The rhombic is a "travelling-wave" antenna, contrasted with the more common "standing-wave" or resonant antenna, such as the dipole. A travelling-wave antenna is non-resonant at any particular frequency, being useful over a wide band of frequencies. As a result, the impedance of the antenna does not vary nearly as much as it does on a standing-wave antenna. Calculating the impedance variations of a rhombic, it is theoretically useful over about a 5:1 frequency range. Other factors enter in, however, so that commercial users find that the practical useful range is over about a 2:1 frequency ratio.

The average rhombic weighs in with a characteristic inpedance of around 800Ω. Antenna experts found that this impedance can be lowered by using multiple conductors on the legs. These conductors are together at both ends of the antenna, but separate as they go toward the sides, where they will be a meter or so apart. The capacitance will vary in a manner which maintains a constant impedance. At the sides, the center wire will appear to be outside the upper and lower wires, because each wire is of identical length. Most commercial users have a 600Ω antenna.

A properly built rhombic system contains the terminating resistor at the opposite end from the feed point. This resistor gives the system the characteristic front-to-back ratio, the big selling point of the rhombic. The resistor should be matched to the characteristic impedance of the antenna and should be capable of dissipating half the power





applied by the transmission line (which, naturally, should also match the antenna impedance). At amateur power levels there is no great problem in building a resistance network to take the heat, but commercial users use "dissipation lines" rather than fixed resistors.

The average radiation efficiency of a terminated rhombic is around 67%. This compares with the radiation efficiency of a dipole at substantially 100% – but remember the power dissipated in the termination resistance.

It would be possible to use reams of polar coordinate paper calculating radiation patterns for rhombic antennas at various tilt angles, leg lengths, heights, etc. Probably a computer could be programmed to spew forth thousands of these in a few minutes. For the purposes of this discussion, we will look at ten patterns obtained from the same antenna. The patterns start at a leg length of 1λ and go to 4λ; the height starts at 0.3λ and goes to 1.2λ. This is the same antenna operating at several frequencies with the radiation patterns given for 10λ and 20λ radiation angles.

Note: the diagrams contain ticks on the major axis for 0dB gain in relation to isotropic and for 0dB gain for dipole, identified as 0dB and DI respectively.

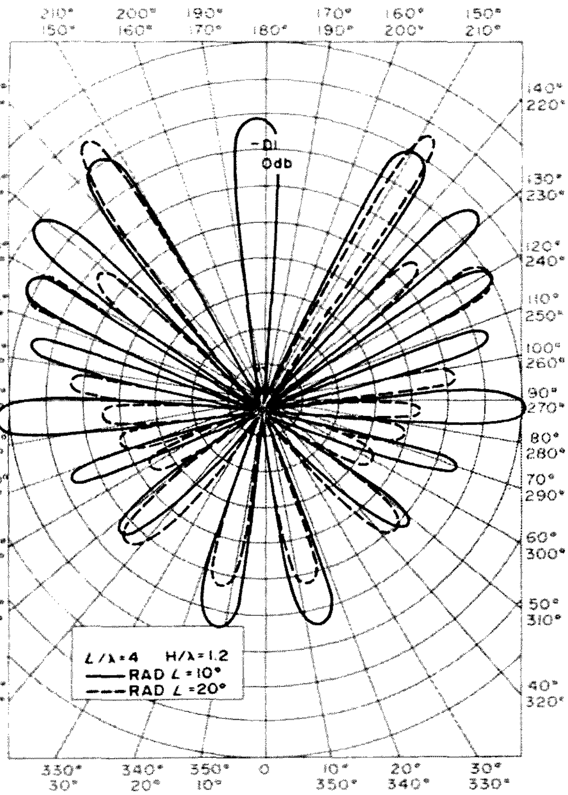
Disadvantages

1. Radiation pattern shows considerable change over frequency range.
2. Very poor front/side ratio.
3. Power lost in terminating resistor.
4. Antenna cannot be rotated for typical amateur use.
5. So what if you want to make a contact within 400 miles?
6. System requires enormous quantity of real estate.
7. Four supports are essential.

Advantages

1. Impedance varies little over considerable frequency range.
2. Very high front/back ratio.
3. Power concentrated in desired direction.
4. Ideal antenna for point-to-point communications.
5. Antenna excellent for low-angle, long-distance communication.

Rhombic users have developed several variations of the system. For additional gain, it is possible to stack two rhombics. For use on more than 2:1 frequency range, it is possible to build a rhombic inside another rhombic, saving one support (the "nested"



rhombic); to suppress undesirable side radiation; two rhombics can be interlaced, adding gain to the main lobe and cancelling the side lobes. The radiation angle can be changed by tilting the plane of the wires away from the plane of the ground. See Fig. 2.

After considering the problem of where to point it and the various other problems, I decided not to build a rhombic, since I wanted a more flexible system. I ended up with a phased array, even though suitable for only one band, the side supression will be better and I really don't need the extreme front-to-back ratio.

The next time you think about an ideal antenna, remember the rhombic may have excellent forward gain, but it also has considerable side radiation (and reception) and is inflexible, which quality alone would make it questionable for most amateurs.

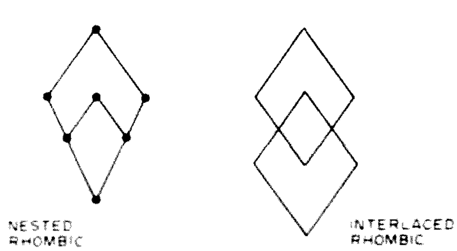


Fig. 2

. . . WA6CPP

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2N3565 TYPE Gen. Purpose High Gain (TO-106)	6/$1.00
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2N3866 TYPE RF Pwr Amp 1-2 W @ 100-600 MHz	$1.50
2N3903 TYPE GP Amp & Sw to 100 mA and 30 MHz	6/$1.00
2N3904 TYPE GP Amp & Sw to 100mA (TO-92)	5/$1.00
2N3919 TYPE RF Pwr Amp 3-5 W @ 3-30 MHz	$3.00
Assort. NPN GP TYPES, 2N3565, 2N3641, etc. (15)	$2.00
PNP:	
2N3638 TYPE Gen. Purpose Amp & Sw	4/$1.00
2N4249 TYPE Low-Noise Audio Amp 1 μA to 50mA	4/$1.00

• FET's:

N-CHANNEL (LOW-NOISE):	
2N4416 TYPE RF Amplifier to 450 MHz (TO-72)	2/$1.00
2N5486 TYPE RF Amp to 450 MHz (plastic 2N4416)	3/$1.00
2N5163 TYPE Gen. Purpose Amp & Sw (TO-106)	3/$1.00
2N4091 TYPE RF Amp & Switch (TO-106)	3/$1.00
1TE4868 TYPE Ultra-Low Noise Audio Amp.	2/$1.00
Assort. RF & GP FET's, 2N5163, 2N5486, etc. (8)	$2.00
P-CHANNEL	
2N4360 TYPE Gen. Purpose Amp & Sw (TO-106)	3/$1.00
M104 TYPE MOS FET (Diode protected) 0.3 pF	$3.00

• LINEAR IC's:

555X Timer 1 μs-1 hr, Dif. pinout from 555 (DIP)	$ .90
709 Popular OP AMP (DIP/TO-5)	$ .39
723 Voltage Regulator 3-30 V @ 1-250mA (DIP/TO-5)	$ .75
739 Dual Low-Noise Audio Preamp/OP AMP (DIP)	$1.00
741 Freq. Compensated OP AMP (DIP/TO-5/MINIDIP)	$ .45
2556 Dual 555 Timer 1 μsec to 1 hour (DIP)	$1.55
LM305 Positive Voltage Regulator (TO-5)	$1.25
MC1458 Dual 741 OP AMP (MINI-DIP)	$ .95
Assorted Linears-741/709/723, etc. (4)	$2.00

• DIODES:

1N914 TYPE Gen. Purpose 100V/10mA	10/$1.00
1N3600 TYPE Hi Speed SW 75V/200mA	6/$1.00
1N4608 TYPE GP & SW 80V/400mA	6/$1.00
1N3893 TYPE RECTIFIER Stud Mount 400 V/12 A	2/$1.00
1N749 ZENER 4.3 Volt 400mW	3/$1.00
1N753 ZENER 6.2 Volt 400mW	4/$1.00
1N755 ZENER 7.5 Volt 400mW	4/$1.00
1N757 ZENER 9.1 Volt 400mW	4/$1.00
1N758 ZENER 10 Volt 400mW	4/$1.00
1N965 ZENER 15 Volt 400mW	4/$1.00
1N968 ZENER 20 Volt 400mW	4/$1.00
D5 VARACTOR 5-50 W Output @ 30-250 MHz, 7-70 pF	$5.00
F7 VARACTOR 1-3 W Output @ 100-500 MHz, 5-30 pF	$1.00

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OK. I've seen articles in ham magazines about computers, but how can computers help hams enjoy their hobby more?

This article describes how the Southeastern DX Club (SEDXC) uses an IBM System/3 computer to help its members work more (and rarer) DX. Before you go on to the next article, you should know that these programs are available to any ham organization, and that the computer time to run them can usually be obtained for *nothing* (or next-to-nothing) anywhere in the country.

The Southeastern DX Club, which has about 50 members mostly from the Atlanta area, has been in existence for more than 20 years and, as you might expect, many of the Old Timers already have 300+ countries confirmed. Late last year the club decided to try to attract new members who were just beginning to work DX; these programs were designed to help *all* club members work countries they needed – whether they needed two countries or two hundred.

With 50+ members obviously a great deal of listening is done on all DX bands. If there were some way to let the membership know about a DX country that *he* needs, those 100 pairs of ears (more or less) could really give the club member an edge on finding those elusive prefxies.

How It Works

Briefly then, this is the way that goal was reached. First, each member was asked to turn in a list of countries needed; in the case of those who had confirmed only a few, he could turn in the ones he had and the computer would indicate that he needed the rest. From this information up to five

DATE--- 6/22/73 SOUTHEASTERN DX CLUB 'COUNTRIES WANTED' LISTING ---PAGE 1

PREFIX	COUNTRY	BEAM	ALL MEMBERS NEEDING THIS COUNTRY -- CONSULT N/A ROSTER
A2,ZS9	BOTSWANA	103	W4UYC WA4VWV WB4UPC W4JII W4MIA K4PGM K4JAG W4OJ1 WA4OQD W4REI WB4NFF W4DJU WA4DWN K4EXE WB4IIJ
AC3	SIKKIM	007	W4UYC WB4WMG WA4VWV WB4SEO WB4RUA WB4UPC K4RDZ K4IBN WA4NIB WB4NVH K4RCS W4JII K4PGM W4MIA WA0J1 W4KNW K4JAG WA4OQD W4KEI K4OEI WB4NFF KABAI W4BOJ K4DJC W4DJD WA4DWN W4DXI K4EEK W4EJN KAEAE W4GIW W4GKF W4GTS WB4IIJ
AC4	TIBET	00A	W4UYC WBASEO WA4VWV WB4WNG K4IBN WB4RUA WB4UPC K4RDZ W4YWX WB4NVH WA4NIB WB4NFF K4RCS W4JII W4KNW K4PGM W4MIA W4OJ1 WA4OQO WAREI K4OEI K4JAG K4BAI WABFR WABOJ K4DJC W4DJU WA4DWN W4UXI K4EEK W4EJN K4EXE K4EZ W4GIW W4GKF W4GTS K4GXO WB4IIJ
AC	BHUTAN	006	W4UYC WB4SEO WA4VWV WB4UPC K4TBN WB4WMG WB4RUA K4RDZ KAJAG WBANVH WA4NIB WB4NFF K4RCS W4JII K4PGM W4MIA W4KNW W4UJ1 W4KEI WA4OQO K4OEI K4BAI W4BOJ K4DJC W4DJD WA4DWN K4EEK K4EXE WAGIW W4GKF W4GTS K4GXO WB4TIJ
AP	EAST PAKISTAN	006	WB4RUA WB4WMG W4UYC WB4UPC WB4SEO WA4VWV K4IBN K4RDZ K4OEI WA4NIB WB4NVH K4JAG WB4NFF K4PGM W4JII W4MIA W4OJ1 W4KEI WA4OQO KABAI W4BFR W4BOJ W4DJU WA4DWN W4EJN K4EXE W4GIW W4GKF K4GXO WB4IIJ
AP	WEST PAKISTAN	029	K4RDZ WBAWMG W4UYC WB4SEO WB4RUA WB4UPC K4TBN WA4VWV W4KEI W4MIA WB4NVH WAANIB K4JAG W4JII K4PGM WB4NFF W4OJ1 WA4OQO W4BOJ WADJD WA4DWN K4EXE W4GIW W4GKF WB4IIJ
BV	FORMOSA	334	K4RDZ WB4WMG WB4UPC W4UYC K4IBN WB4RUA WB4SEO WA4VWV W4KEI WA4OQD W4MIA WB4NVH WA4NIB K4PGM W4UJ1 W4KNW K4JAG WB4NFF W4BOJ W4DJD WA4DWN K4EEK K4EXE W4GIW W4GKF W4GTS WB4IIJ
BY	CHINA	344	WA4VWV WB4SEO K4RDZ WB4UPC WB4WMG W4UYC K4TBN WB4RUA W4OJ1 K4JAG W4KNW WA4OQO WB4NFF W4KEI K4OEI W4JII K4RCS WA4NIB WB4NVH K4PGM K4BAI W4BFR W4BOJ K4DJC W4DJD WA4DWN K4EEK W4EJN K4EXE W4GIW W4GKF W4GTS K4GXO WB4IIJ
C2,VK9	NAURU IS.	281	WB4RUA WA4VWV WB4WMG WB4SEO WB4UPC W4UYC WA4OQO W4KEI WB4NFF K4JAG WA4NIB W4OJ1 WB4NVH W4BOJ WA4DWN K4EXE WB4IIJ
C3,PX	ANDORRA	055	W4UYC WB4RUA WA4VWV WB4SEO WB4UPC WB4WMG WA4OQO W4KEI WB4NFF K4JAG W4OJ1 W4DJD WA4DWN K4EXE W4GKF WB4IIJ
CE	CHILE	168	W4UYC WB4UPC W4DJU K4EXE WB4IIJ
CE9AA-AM,KC4,VP8,ETC.	ANTARCTICA	180	W4UYC WB4UPC W4REI W4UJI W4DJD WA4DWN K4EXE
CE0A	EASTER IS.	204	W4UYC WB4SEO WB4WMG WB4UPC W4KEI WB4NFF K4PGM W4OJI K4JAG W4DJD WA4DWN K4EXE WB4IIJ
CE0Z	JUAN FERNANDEZ	176	WB4RUA WA4VWV W4UYC K4RDZ WB4SEO WB4WMG K4IBN WB4UPC K4JAG W4OJI WA4OQO W4MIA WA4NIB W4REI WB4NVH WB4NFF K4PGM W4BOJ K4DJC W4DJD

Fig. 1. SEDXC "Countries Wanted" listing.

96-column punched cards were prepared containing:

- Call sign
- Name, address
- Telephone number
- An indicator showing whether the member is interested in Phone, CW or both
- Time-of-day after which he does not wish to be telephoned about the appearance of a needed country
- A series of punches indicating which countries the member *does not* need

A number was arbitrarily assigned to each valid country on the ARRL Country List and a card column assigned to each one. VP1 (British Honduras) was assigned number 419. If the member did not need VP1, then a punch was placed in column 19 of card number 419 and so on. That's all the data preparation the club member needs to do.

These punched cards are processed by the programmer which creates a magnetic disk record for each country needed by each member. This file of records is then electronically sorted by the computer and a listing is produced showing: prefix, country name, beam heading (from Atlanta, of course), and the call sign of *all* members needing that country.

The same data file is again electronically resequenced and a list is produced showing each member and *all* the countries *he* needs. This listing serves as a checklist against the keypunching from his original list, as well as a document on which he can mark off new countries as he works them. The three-digit IBM number makes things easier for the keypunch operator. For example:

AC3 Sikkim 007 210

means that Sikkim is assigned card column 10 in card number 2 (007 is the beam heading from Atlanta – neat, huh?).

These same cards are used to print the membership roster and mailing labels for the monthly bulletin. The roster and the "Countries Wanted" lists are distributed to all club members.

How To Use It

Suppose W4MCM hears a station in

Botswana (A2C) on 20m at 14.210 MHz. Now, Bob doesn't need Botswana so he just tunes right on by, right? Before the computerized DX system, he might have; but now he looks at the "Countries Wanted" list and discovers that fourteen club members need the Country. He looks up K4JAG (for example) and finds that John has a General Class ticket (remember, the Botswana station was at 14.210 MHz) so he looks again and calls W4DJD on the land-line and Frank hops on the frequency like gangbusters.

It's terrific! Every club member is another pair of ears for every other club member. Whether he calls one guy, two, or more, the chain is started and suddenly the DX station is swamped by Southeastern DX club members.

Obviously, W4MCM is going to *make* a lot more telephone calls than he will receive (he only needs Iraq and Heard Island to have 'em all) but the "Old Timers" in the club tell me that this program has given them renewed interest in ham radio. It gives them something productive to do while they

DATE--- 6/22/73 SOUTHEASTERN DX CLUB "WANT LIST" FOR K4BAI

PREFIX	COUNTRY		IBM NO.
AC3	SIKKIM	007	210
AC4	TIBET	004	211
AC	BHUTAN	006	212
AP	EAST PAKISTAN	004	213
BY	CHINA	344	214
FB8Z	AMSTERDAM & ST PAUL ISL.	111	250
FB8W	CROZET ISL.	124	251
FH8,FB8	COMORO ISL.	079	255
FO8	CLIPPERTON ISL.	229	259
FR7	GLORIOSO ISL.	075	262
FR7	JUAN DE NOVA	084	263
FR7	TROMELIN	015	265
HK0	MALPELO ISL.	175	285
KG6R,S,T	MARIANA ISL.	307	321
PY0	ST. PETER & ST. PAUL'S ROCKS	124	361
PY0	TRINDADE & MARTIN VAZ ISL.	128	362
VK	LORD HOWE ISL.	253	414
VK9X	CHRISTMAS ISL.	336	418
VK9Y	COCOS ISLS.	356	419
VK0	HEARD ISL.	147	423
VP8,LU-Z	S. SANDWICH ISL.	153	440
VQ9	CHAGOS ISL.	043	448
VQ9	DESROCHES	045	449
VQ9	FARQUHAR	045	450
VS9K	KAMARAN ISL.	055	462
VU	LACCADIVE IS.	030	466
XT	VOLTAIC REP.	084	469
XU	CAMBODIA	347	470
XZ2	BURMA	000	472
YI	IRAQ	042	474
YJ,FU8	NEW HEBRIDES	264	475
YK	SYRIA	046	476
ZK1	MANIHIKI ISL.	254	493
ZL	CHATHAM ISL.	232	496
ZM7	TOKELAUS	261	511
ZS2	PRINCE EDW. & MARION ISL	125	514
1S	SPRATLY ISL.	352	517
3W8,XV5	VIETNAM	344	522
3Y,LA/G	BOUVET ISL.	040	524
4W	YEMEN	054	527
8F,PK,YB	INDONESIA	337	544
8Z4	SAUDI ARABIA/IRAQ NEUTRAL ZON	044	550
	ABU AIL, JABAL AT TAIR	062	564
	BLENHEIM REEF	---	565
	GEYSER REEF	079	566
VK9	MELLISH REEF	261	568
SY	MT. ATHOS	047	569

Fig. 2. SEDXC individual member "Want" listing.

6/22/73 --- SOUTHEASTERN DX CLUB MEMBERSHIP ROSTER --- PAGE 1

CALL	NAME AND ADDRESS	LICENSE CLASS	INTERESTED IN: PHONE	CW	MEMBERSHIP CATEGORY	TELEPHONE NUMBER	CALL AFTER 7:00 AM AND NO LATER THAN:	CALL	MEMBER?
K4BAI	JOHN T. LANEY, III	GENERAL	•	•	200-299	NEVER		K4BAI	A
W4BFR	BRUCE E. MONTGOMERY	EXTRA	•	•	300- UP	255-1348	22:00 LOCAL	W4BFR	X
W4BHG	JAMES H. MILLARD					233-0278		W4BHG	A
K4BOE	JOHN GREEN					435-4059		K4BOE	
W4BJJ	GORDON MORGAN	ADVANCED	•	•	100-199	355-9694	ANYTIME	W4BJJ	X
W4BYU	EDWARD H. MAU					872-0530	23:00 LOCAL	W4BYU	X
WA4DAA	BILL COX							WA4DAA	
K4DJC	E.W. SLEIGHT	EXTRA	•	•	200-299	766-4050	23:30 LOCAL	K4DJC	X
W4DJD	FRANK JORDAN	ADVANCED	•	•	000-099	458-9987	ANYTIME	W4DJD	X
W4DMB	DUB DAWKINS							W4DMB	X
WA4DWN	DON FLENNER	ADVANCED	•	•	000-099	926-2386	23:00 LOCAL	WA4DWN	X
W4DXI	CLAY GRIFFIN	EXTRA	•	•	200-299	753-0601	23:30 LOCAL	W4DXI	X
K4EEK	WHIT RUSSELL	ADVANCED	•	•	300- UP	366-7997	ANYTIME	K4EEK	X
W4EJN	JAMES W. FIELDS	ADVANCED	•	•	200-299	349-2063	23:00 LOCAL	W4EJN	X
K4EXE	JOHN OLSON	GENERAL	•	•	000-099	373-0553	20:00 LOCAL	K4EXE	X
K4EZ	BEN A. ADAMS	EXTRA	•	•	300- UP	636-1010	23:00 LOCAL	K4EZ	X
W4GIW	VAN FAIR	ADVANCED	•		200-299	939-7045	23:00 LOCAL	W4GIW	X
W4GKF	CHAZ CONE	ADVANCED	•		100-199	255-2666	23:00 LOCAL	W4GKF	X
W4GTS	PHILIP J. LATTA	ADVANCED	•	•	300- UP	233-4939	ANYTIME	W4GTS	X
WA4GWN	WAYNE CLINTON							WA4GWN	
K4GAO	TOM BRADLEY	EXTRA	•		300- UP	634-7228	ANYTIME	K4GAO	X
WB4IIJ	PETER D. BERRY	GENERAL	•		000-099	261-4761	23:00 LOCAL	WB4IIJ	X
K4JAG	JOHN HARDEN, JR.	GENERAL	•	•	100-199	351-1309	ANYTIME	K4JAG	X
W4JII	JOHN F. LARKIN	ADVANCED	•	•	200-299	761-3756	21:00 LOCAL	W4JII	X
W4KNW	JACK MC CLAIN	EXTRA	•	•	200-299	938-3787	22:00 LOCAL	W4KNW	X

Fig. 3. SEDXC membership roster.

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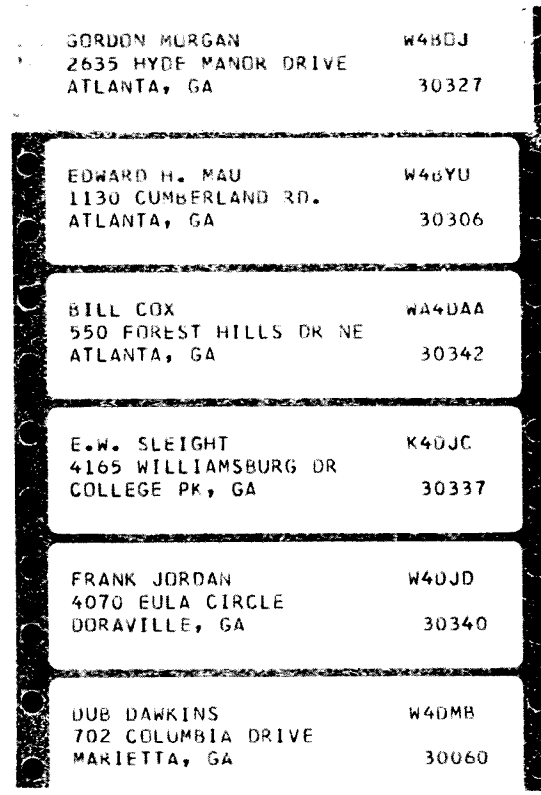


Fig. 4. SEDXC mailing labels.

listen for hours looking for the few countries they need; if they don't hear what *they're* hot after, at least they can help a fellow DX club member.

It really works. I made a mistake in my own record (the old computer adage: "Garbage In, Garbage Out") and showed on the "Countries Wanted" listing that I needed Japan. The first week after the list came out I received thirty phone calls about Japan being heard on 20m!

Quarterly each member submits a new list showing the countries worked since the last printing and new lists are produced. We reduced all the lists to 8½" x 11" for ease of use and 3-hole drilled them – you might want to do the same.

In the year that the system has been in operation, more than 300 countries have collectively been added to members' country totals. The competitive edge the club membership has over the DXer working alone has resulted in practically every serious DXer in the Atlanta area joining the SEDXC.

The system removes none of the challenge of getting in the pile-ups and hollering your lungs out; and every one of us has been called by friends to alert us to DX openings, computer or not. But with the SEDXC system, you only get calls when it's a country you *need* and when he's operating in a band segment where you are licensed to operate.

The package of programs is available from the SEDXC, Post Office Box 11555, Atlanta GA 30305 for $25 postpaid anywhere in the U.S. The programs (for you computer buffs out there) are written in IBM RPGII and require a minimum disk IBM System/3 Model 10. The entire operation should take about an hour to run once you've punched your cards.

Ask around – one or more of your members has access to the required computer configuration and most companies will happily provide the time.

Here's a way to efficiently work more DX with the aid of one of mankind's best tools. Good DX!

. . . W4GKF

Elliott S. Kanter W9KXJ
3242 W. Hollywood Avenue
Chicago IL 60659

HEATHKIT GR-78 General Coverage Receiver Test/Review

When I first read the ad for Heath's GR-78, I was immediately enthusiastic about both its specifications and its very reasonable price. After all, it has many features not usually found in receivers costing less than $200. I arranged to acquire one from Heath to give it the skeptic's "I'm from Missouri. . .show me!" test.

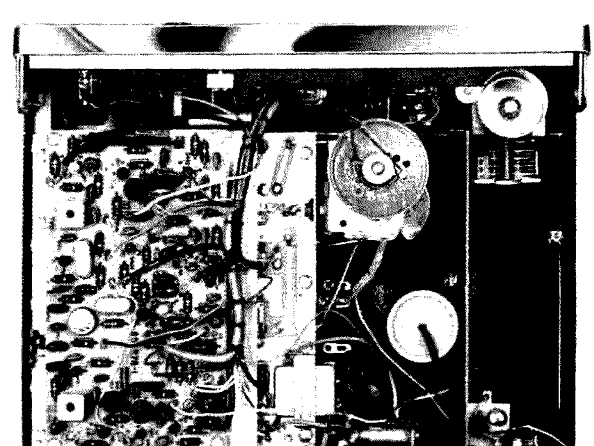
When my GR-78 arrived, the first thing I noticed was the way it had been packaged, Each component relating to a specific stage in construction was in a special box with a number keyed to a portion of the comprehensive instruction manual.

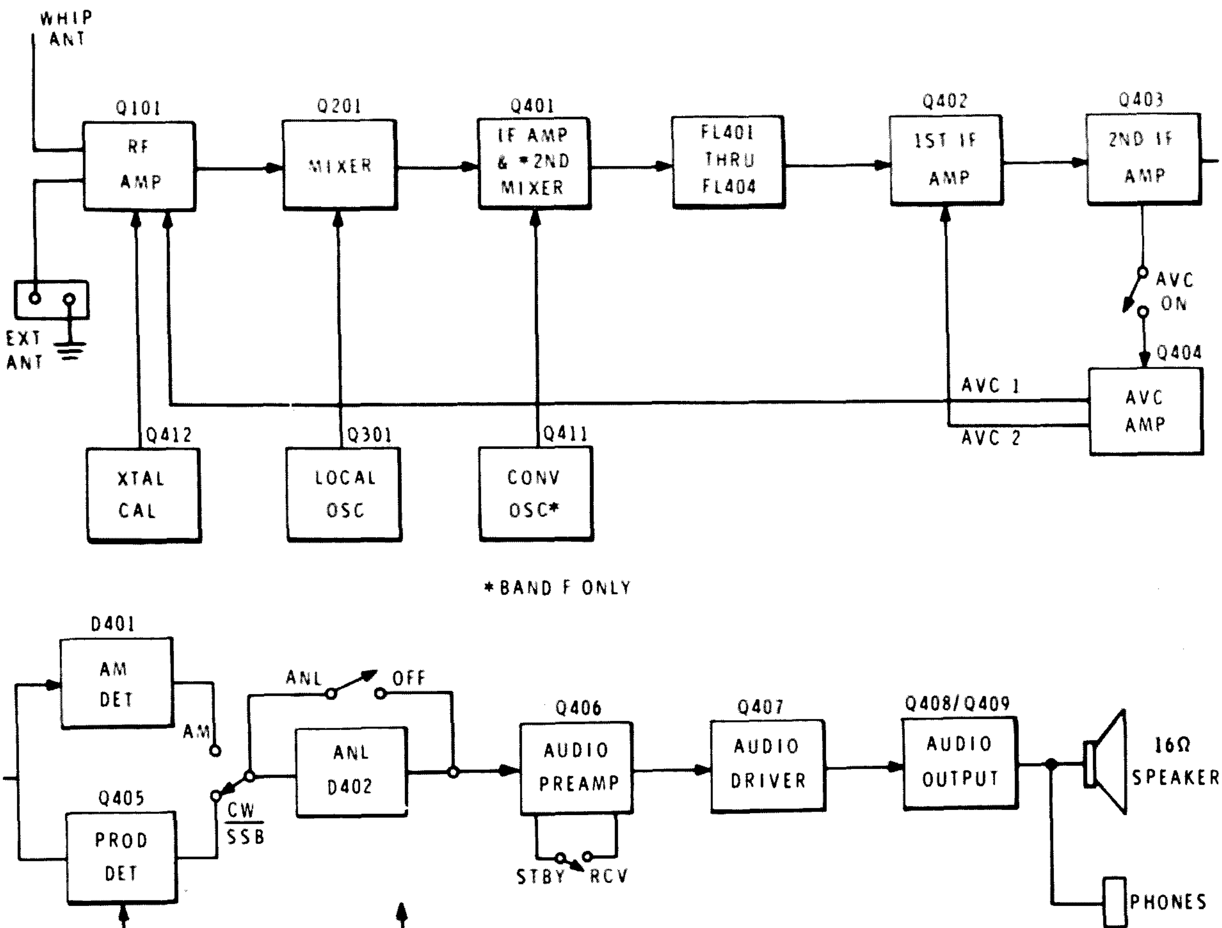
According to the specs, the GR-78 is a solid state portable (internal nicad battery) or home receiver operating on *either* 120/240V ac. Its coverage span is 200 kHz–30 MHz in six divisions. According to Heath, the receiver is designed primarily for amateur or shortwave listener use. A selection as to band spread coverage desired (ham or SWL) is made during construction and two calibrated band spread scales are included, one for ham use, the other for SWL'ers. The internal battery is "floated" across a unique charging circuit which insures that it will be fully charged providing the receiver is operated a few hours or so in the ac mode. This feature means that in case of power failure, you are still on the air as far as your receiver goes, and for field day, hurrah! no more generators, you just operate from the internal battery.

The receiver is designed to receive AM/CW/SSB transmissions with a front panel selector switch selecting the mode desired. A built-in whip antenna will suffice for many applications, but provisions are incorporated into the rear panel for an external antenna.

That a greal deal of thought went into the GR-78's development is evidenced by such features as a collapsible carrying handle, battery-saving switching for panel lamps, integral 500 kHz calibrator, ceramic i-f filters and an excellent noise limiter. Plug-in modulator circuit boards complete with single wafers of the main selector switch aid in simple, accurate assembly and cut the time required to wire this kit to around 35 hours, not counting calibration.

The all solid state circuitry includes 13 silicon transistors, five of which are FET's, two germanium transistors (audio stage), and a separate FET product detector to provide excellent CW and SSB reception. The audio circuit is novel (see schematic); its transformerless audio output circuitry combined with the all solid state receiver circuit





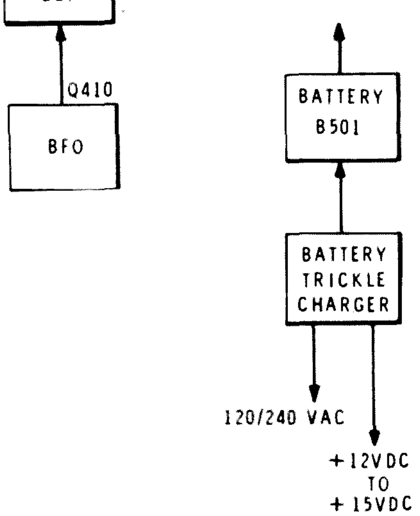


Fig. 1. Block diagram of GR-78.

provides excellent reproduction while conserving on power drain (most important when operating from the battery).

The majority of the components allied to the receiver including crystals, i-f filters, and the audio stage mount to the receiver circuit board. This board is wired first and contains a number of steps whereby the component density is increased gradually until you finish assembly, at which point you will note that the board is literally crammed with components. Because of the number of components and their close proximity, we elected to use a very fine tip, an Ungar "Princess" soldering pencil to minimize damage to heat sensitive components and to avoid solder "bridges."

During the assembly process, I noted that a goodly number of components could be heat sensitive and might conveniently change value if overheated. Being a pessimist by nature, I assembled each of the pc boards on a large, common household sponge liberally moistened with water. The board was placed on the sponge component side down and soldering operations carried out. The sponge acted as a giant heatsink and conducted possibly damaging heat away from the components. The purist who never uses heat sinks might be made a believer by the sound of hissing emitting from that sponge. This hint might save a few hours of trouble shooting later. Besides, the sponge makes an excellent work surface and holder for the pc board.

Referring to the block diagram (Fig. 1) and the schematic (Fig. 2), we note that rf signals received from either the whip antenna or an external antenna are coupled to the input tuned circuit for Band A. The circuit consists of antenna coil L1, trimmer capacitor C1 and the first section of capacitor C501A. The signal is then coupled to gate 1 of FET Q101 via a tap on L1. Bias voltage for Q101 is obtained from the AVC amplifier and applied to gate 2. Source resistor R103 and rf gain control R501 provide the proper drain current for normal operation.

The amplified signal from Q1-1 is fed to a tap on rf coil L101 which together with trimmer capacitor C101 and capacitor C501b form the input tuned circuit of the first mixer stage Q201.

The first mixer, Q201 is a dual gate FET featuring excellent freedom from cross-modulation, overloading and the pulling effect on an oscillator that a strong signal frequently has. The amplified signal from Q101 is applied to gate 1 of Q202 through capacitor C111. The local oscillator signal from Q301 is applied to gate 2 of Q201 biased by resistors R203-204. The dc operating point is established by source resistor R205.

The incoming signal and the oscillator signal are heterodyned in Q201 resulting in an i-f frequency and mixer product. On bands A through E the output of Q201 is fed to a tap on coil L201 resonating with capacitor C201 to provide a 4.034 MHz output signal.

The output from Q201 is coupled through capacitor C205 to gate 1 of FET Q401, which operates as an i-f amplifier on Bands A–E and as a mixer (2d mixer) providing double conversion on Band F. Operating bias for gate 2 is provided by resistors R-401-402. When the band switch is in the Band F position, a 3.579 MHz injection signal from conversion oscillator Q411 is applied to gate 2 of Q401.

This signal combines with the 4.034 MHz signal from the 1st Mixer Q201 and results in an output of 455 kHz plus the mixer product frequencies. This output signal is then coupled through capacitor C410 to ceramic passband filters FL401 through FL404. These filters serve to shape the bandpass and attenuate all frequencies except the i-f frequency of 455 kHz. This i-f signal is coupled to the base of the first i-f amplifier stage Q402.

Bias for Q402 is obtained from a voltage divider network comprised of resistors R415 and R418. Resistor R431 supplies an avc voltage from avc amplifier Q404 which will correspond in value to the changes in incoming signal strength.

I-f amplifier stage Q402 also contains the relative strength metering circuitry. The meter is connected between the emitter of Q402 and the meter's zero adjust control R408. The zero-adjust control is connected to a positive dc supply voltage and can be adjusted to give a zero indication on the meter. The meter also monitors avc action and provides a visual method of indicating the relative changes in avc voltage and therefore indicates relative signal strength.

The amplified signal from Q402 is coupled through capacitor C415 to the base of Q403 (i-f amplifier–2d stage). Bias for this stage is obtained via a voltage divider network made up of resistors R419 and R420. Transistor Q403 is also stabilized by emitter resistor R422 which is bypassed to ground by C416.

The receivers' local oscillator Q301 is a single-gate FET. The oscillator tuned circuit consists of coil L301, trimmer C301 and tuning capacitor C501C. Oscillator injection voltage is coupled through capacitor C308 to gate 2 of mixer Q201. This Hartley oscillator operates 455 kHz higher than the received signal on Bands A, B, C and D and the 455 kHz lower in frequency than signals on Band E and 4.034 MHz higher on Band F.

Detection is provided when a portion of the output signal from Q403 is applied to AM detector D401 for amplitude-modulated reception. The output signal is also applied through C429 to gate 1 of product detector Q405 for CW/SSB reception. Q405 is a dual gate FET with excellent isolation characteristics between gate 1 and 2 to eliminate BFO oscillator "pulling" or overloading on strong signals.

Injection voltage coming from BFO oscillator Q410 is applied to gate 2 of Q405 for CW/SSB reception. The i-f signal and the BFO signal are mixed, the resultant output is

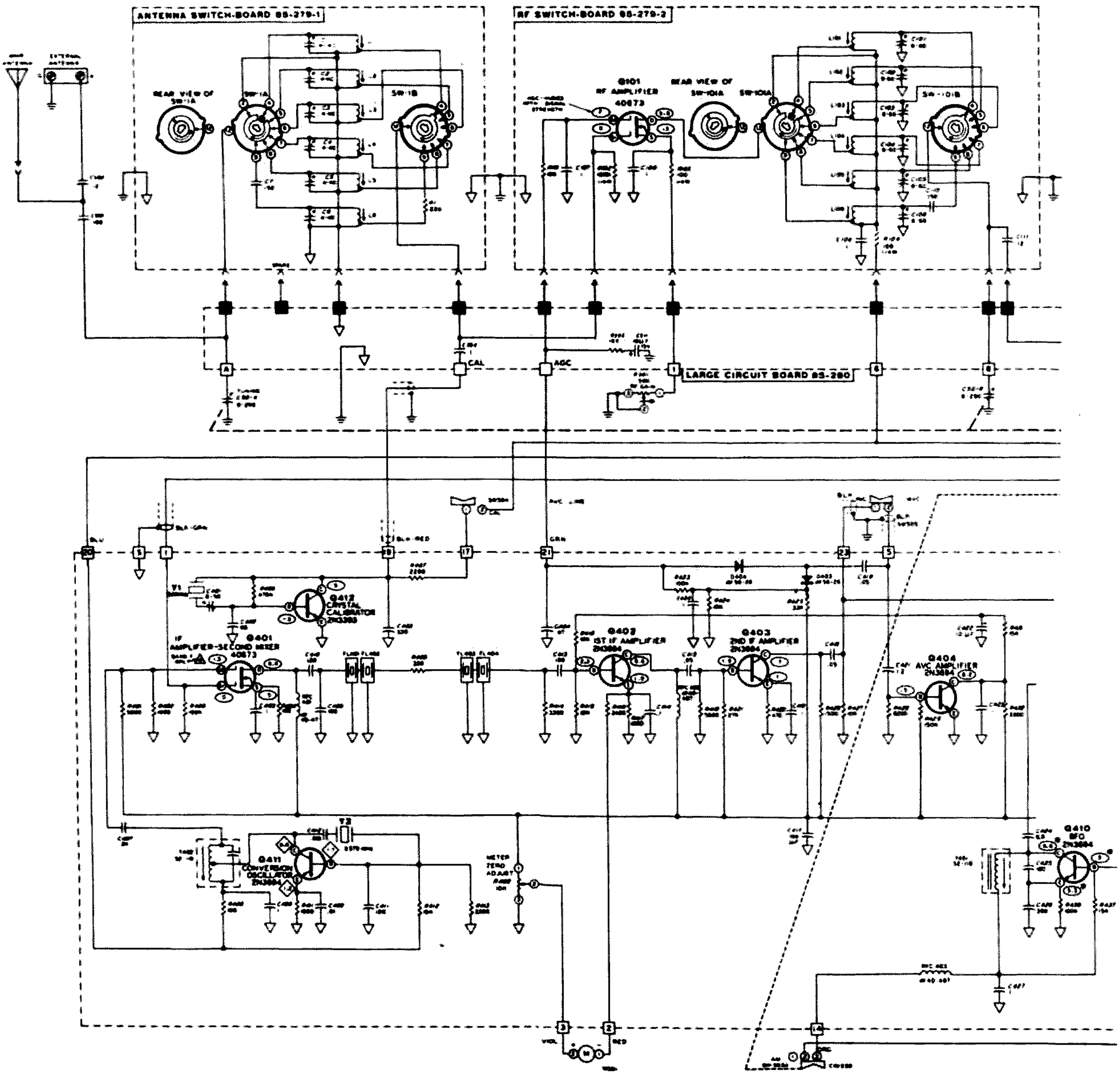


Fig. 2. Schematic, GR-78.

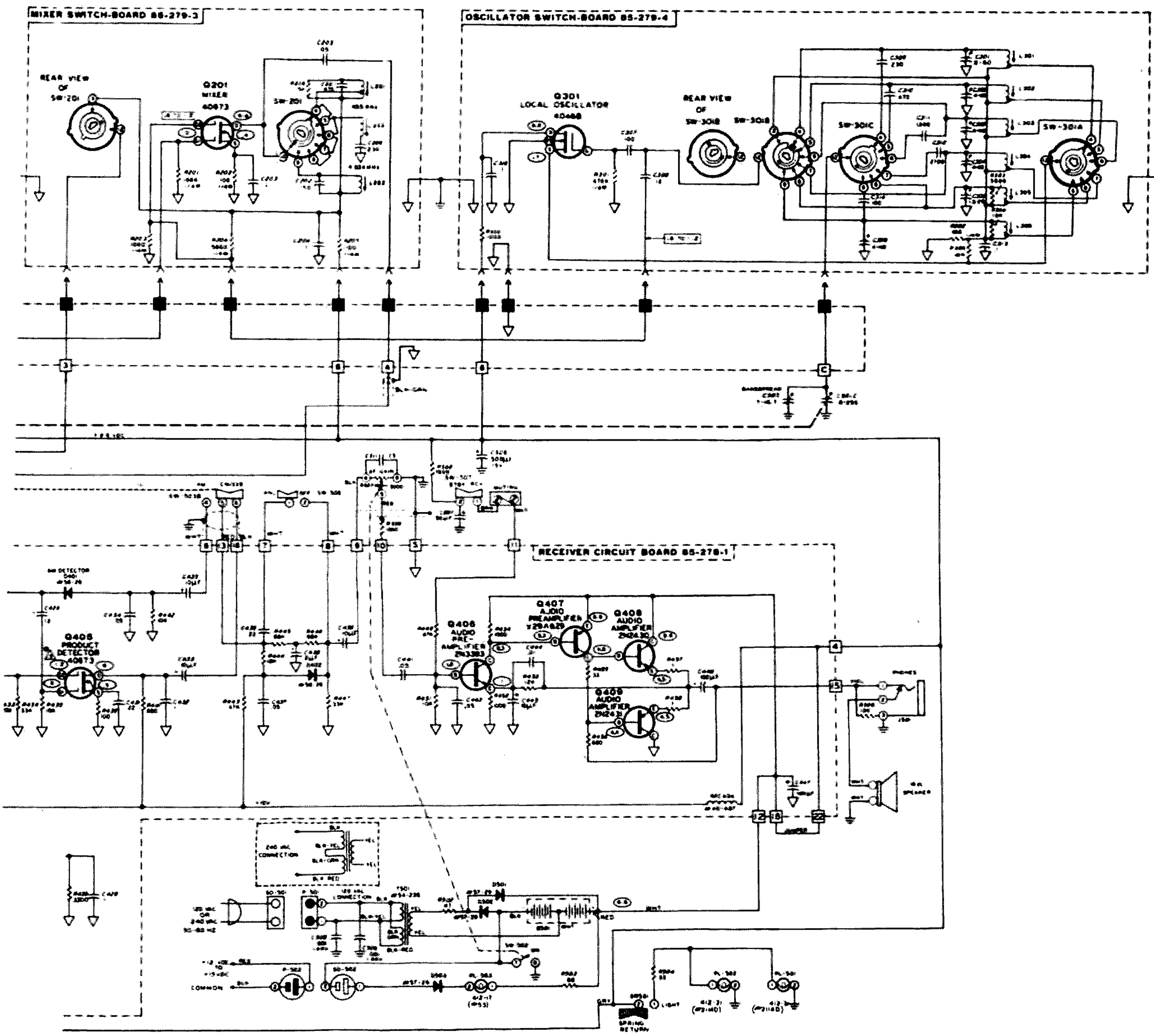
an audio signal developed across R441 and coupled through C433 to selector switch SW503B.

The BFO is a Colpitts oscillator made up of Q410, C425 and C426 to provide the proper feedback for oscillation and to form a tuned circuit with T401 to resonate at 455 kHz. Resistors R437-438 form a voltage divider and apply dc biasing to the base of Q410. Emitter resistor R436 provides temperature stabilization for the transistor. Injection voltage is coupled to gate 2 of Q405 through C424. The BFO is actuated by the AM/CW/SSB switch in the CW/SSB position which applied dc operating voltage through RFC403.

The audio signal coming from R505 is coupled through C441 to the base of audio-pre-amp Q406. The audio output is developed across the load resistor R454 and directly coupled to driver transistor Q407. The output of Q407 is directly coupled to a complementary pair of transistors Q408-409 with audio output coupled through C446 to either the 16Ω speaker or a headphone jack. A portion of the output is fed back to the emitter of Q406 to aid in stabilization of the stage and minimize distortion.

Miscellaneous Circuitry

Transistor Q412, crystal Y1 and associated circuitry form a 500 kHz calibration



oscillator which is switched on by the front panel calibration switch SW504. The oscillator provides very accurate calibration markings every 500 kHz for dial calibration and band edge marking.

The charging circuit requires that the battery be electrically divided in half for charging from ac. When the ac plug is inserted into a power outlet, the ac voltage from the secondary of T501 is applied through diode D501 on one-half cycles to charge one-half of the battery. The other half-cycle of the voltage is applied through D502 to charge the other half of the battery.

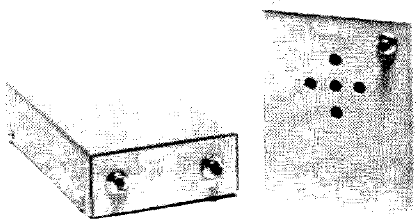
Comments

It would take many more pages to fully explore and expound upon the virtues and the features of the GR-78, and for that reason several portions of the circuitry were left undescribed. It should suffice to say that with simple adherence to the manual, calibration per the manual and operation with a fairly decent antenna, this receiver will surpass many if not all of the receivers available today in its price class and probably a few of the higher priced models.

I would say that the receiver is not a kit to be wired by a novice, who has not yet wet his "teeth" so to speak on other kits, but, the GR-78 has returned countless hours of operating pleasure for those few enjoyable hours of construction. Like my musician buddies might say. . ."The GR-78, Man, it's a gas!"

. . . W9KXJ

Select Call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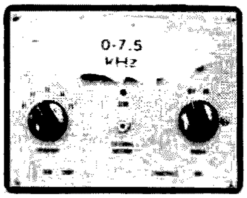

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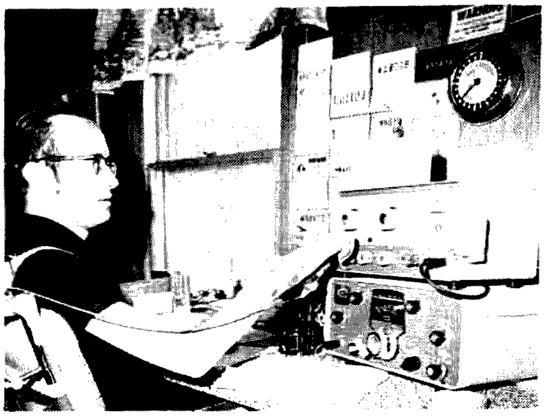
HOW DON GOT HIS MAGIC CARPET

Don Taylor WAØYAH is a quad. In ham lingo, a "quad" is one of two kinds of narrow-beam, high-gain antennas Don Taylor is not an antenna. "Quad," in this case, means all four limbs are paralyzed. He had an accident that severed the spinal cord.

Don Taylor is a Handi-Ham – a member of a group of handicapped people in Minnesota either working toward a "ticket" (ham license) or helping others work. His equipment has been loaned him by other Handi-Hams and the Minnesota Society for Crippled Children and Adults, Inc. (MiSCCA).

When Don wrote a Handi-Ham friend that he was interested in getting on the air, a receiver was placed with him. A month later, a tape recorder and the first tape of the code training course was sent him. He was given the ARRL Gateway series of texts as well. In a very few weeks he passed the Novice tests. When his call came, a transmitter was added to his station, and the tape recorder went to another student.



WAØYAH and his magic carpet.

Don's progress has been rapid. He was a regular traffic man before six weeks had passed, and passed his General tests within months.

The Handi-Ham System is active on 3.930 kHz, Saturday afternoons.

. . . KØGKI

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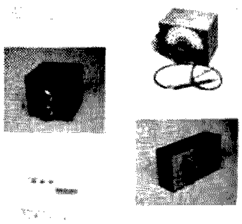

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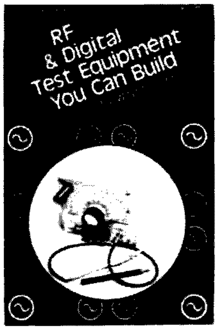

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LEE ADDRESS...
Continued from Page 2.

By a fortunate coincidence, the series of sunspot maxima during the period since 1900 has been in an increasing progression. As you examine the plots of the curves you can see an undulatory waveform which peaked during cycle No. 20 in 1956, with the highest sunspot number ever recorded of 205. Of course, you know we are now on the downhill side of cycle number 21 and the experts still aren't sure just when it will "bottom out." According to some predictions, we are in for a long "dry-spell" of sunspot activity. One prediction is that the next maximum above 100 will not take place until about the year 2015.

So most of our communication developments were occurring during this three quarters of a century. Had it not been for favorable ionospheric conditions, some of our knowledge might not now be available. Thanks to many of you here tonight we have a very sophisticated telecommunication system in the world today. In recent years it has been expanded by the construction of additional multi-channel, advanced submarine cables with several thousand voice-channel circuit capacities, augmented by a satellite communication system with which of course you are familiar through its use in bringing television programs to us from any place in the world.

All of this is a quantum leap from that first trans-Atlantic transmission back in 1901. Therefore today we have a new "ball-game" in telecommunication with emphasis being on the newer modes of transmission, utilizing techniques which only a few years ago had not been even envisaged. This is not to suggest that the older methods of communication are passe, because there will be continuing needs for use of the high frequencies by those countries not so fortunate to possess a satellite earth station or a cable terminal, as well as for back-up facilities.

You old timers can still "smell" the ozone from your old spark gaps. After spark you went after CW with the same zeal (when amateurs were denied the wave-lengths above 200 meters). All of you remember the thrill of getting your first vacuum tube to oscillate on about 200, 160 or 80 meters . . . watching the chemical rectifiers spark as you keyed your "now-silent" transmitter, and sat fascinated by your Poller-Smith hot wire ammeter which was supposed to measure your "radiation."

Amateur radio is a consuming avocation in ones' youth; often an indispensable foundation for a professional career in electronics, and a source of tremendous pleasure and interest later in life. As time marches on, we find a critical eye turned on almost every service which uses the spectrum, searching into whether they use the allocation in their best interests as well as the public's. Amateurs are not immune to these pressures which come from various sources and directions. You know how much interference there is in your HF bands today, with the ever-increasing "sharing" with other services.

In some bands it has gone beyond the bounds of "sharing," because the permitted high-power and high-gain antennas of the high frequency broadcast service, for example, results in an output from a single transmitter of several megawatts of radiated power. Amateurs with a one kilowatt limit (in the United States) cannot compete with such signals. So you have to dodge around and in between their signals, which are spaced every 5 kHz, or give up in disgust. In the VHF, you know that a proposal has been made to initiate a new Class E Citizens Radio Service in one of your bands from 220-225 MHz. In other VHF and UHF amateur bands, requests are constantly received for temporary sharing of the frequencies for specialized, and often highly classified, purposes.

The Commission is seriously studying a "no-code" amateur license . . . . .

So in the tempo of the times, it would be well to realize that Amateur Radio is subject to scrutiny. You all know about the squeaking wheel that gets the grease. The louder the squeak, the more the grease. The loudness of the squeak depends a lot on how many wheels are squeaking! You may not be aware of it, but the Amateur population in the United States is decreasing at the present time by about 350 licensees per month. This is happening while all other services are increasing. The Citizens Radio Service is approaching the 1 million rank. I think this is a serious matter for Amateur Radio, because it tells me something is wrong.

I can't believe that the allure of "ham radio" has disappeared, nor that our youth are so blase in the space age that they no longer get a thrill out of having their own private laboratory with which to field test their equipment on the air. So while most other services are increasing their numbers several fold, the median age of the typical Amateur is now over 40 years. While I am not in a position to suggest a total cure for this situation, it does seem to me that there are some potential remedies which might increase the "squeak factor" of the Amateur Radio Service.

The Amateur and Citizens Division of the Commission is seriously studying a re-structuring of the Amateur Service which, among various things, would make provision for a "no-code" amateur license authorizing operation above 144 MHz. In addition, it would amend the license structure so as to enable licensees in the VHF/UHF region, after further qualifying, to eventually merge and amalgamate their interest and operations with those whose interest are primarily in the HF portion of the spectrum. You are aware, of course, of the tremendous interest being shown in VHF activity, especially on 144 MHz. This is commendable, but not sufficient in view of the other VHF and UHF bands which have been allocated for amateur operation for many years and which are relatively unused.

If I had to ascribe a "merit

factor" to domestic use of the spectrum in light of the demand for communication facilities, I would have to say that the very high and ultra high frequencies are greatest in demand . . . so much so that the Commission has authorized sharing UHF television channels 14 through 20 with land mobile stations, in 13 metropolitan markets throughout the country.

The Commission has been engaged for the past few years in rulemaking involving allocation of 900 MHz frequencies to both common carrier and private industry for provision of new communication circuits, because the lower portions of the spectrum are so congested. These are only two examples of the importance of spectrum space for our domestic requirements. There is a philosophy among allocators that says, " . . . if you don't use it, you lose it." I'm not predicting the loss of Amateur Radio operations in this portion of the spectrum, but I would urge you to engage in long range planning to ensure that the "use it or lose it" philosophy doesn't grab you while you're not looking.

Amateur Radio has a tremendous value to mankind, not only in this country where we permit and encourage amateurs to participate in emergency communication, but in relation to the other aspects of the "Basis and Purpose" of Amateur Radio. One of the paragraphs in that Section of the Amateur's Rules and Regulations refers to the

"Expansion of the existing reservoir within the Amateur Radio Service of trained operators, technicians, and electronic experts."

No one likes to think of our country ever being in a holocaust which would certainly result from a nuclear war.

In March 1943 Goring stated, "We smashed up the amateur radio ham clubs and wiped them out . . . and now we need them."

You might be interested, in hindsight, in one of the reasons that the western nations won World War II. Not long ago I was reading a book entitled "The Rise and Fall of the Luftwaffe" by David Irving, which is an account of the life of Field Marshal Erhard Milch. In one portion of the book there was a discussion among several high ranking German officers about the ineffectiveness of their "Wurtzburg" radar, operating at about a half-meter wavelength. At that time the British and Americans had begun airdrops of aluminum foil "window" cut to a half-wavelength of the German radar frequency. They were very effectively jamming the German radar. Both Hermann Goring and Milch accepted that the German electronics industry had fallen far behind that of the Allies. A basic reason for this was that Britain, and particularly America, had actively encouraged Amateur Radio; while in Germany, Amateurs had been systematically persecuted by the Reich authorities. In March 1943 during a conference on the German electronic industry, Goring stated:

"The main blame belongs to Ohnesorge (Minister of Posts) — he never wanted to relax his grip on anything. We smashed up the amateur radio "ham" clubs and wiped them out, and we made no effort to help these thousands of small inventors. And now we need them."

Thank God we have always encouraged Amateur Radio in America, and the work of many amateurs such as John Reinhartz, Bill Eitel and Jack McCullough, and countless others is tribute to the wisdom of that principle.

What about the future of Amateur Radio? You know that there is scheduled a General World Administrative Radio Conference of the ITU in 1979, at which the entire radio spectrum will be studied, evaluated and considered for reallocation among the various users. In this country we have already begun our investigation of the required spectrum for all our services. This will continue for the next several years, until we decide what the United States' position will be at the Conference. No one can say yet what the U.S. position will be for the Amateur Service. I know the preliminary proposals to the Committee working on the problem are:

- the return of the 160 meter band to amateurs;
- eliminate sharing in the 80 meter band;
- expand 40 meters and eliminate sharing with HF broadcasting;
- establish a new amateur band at 10.1-10.6 MHz;
- expand 20 meters and eliminate sharing with the Fixed Service;
- establish a new amateur band at 18.1 MHz;
- expand the 15 meter band by 100 kHz;
- establish a new amateur band from 24-24.5 MHz, and
- make no changes in the existing ten meter band.

"I have reservations whether the United States should continue to support so strongly the ITU as it is now constituted."

With bands so located, Amateurs would have frequencies about every 3 MHz throughout the spectrum, and their communication efficiency would improve dramatically. Only time will tell whether it is possible for these requests to be incorporated in the United States' position to the 1979 conference. This is your first hurdle. Without the backing of the United States, Amateurs of the world are at a distinct disadvantage at such a conference. In my experience in I.T.U. conferences, I have learned that there is no substitute for advance preparation. There is no magic that can take the place of planning and liaison with other countries. This is especially true today with the voting structure of the I.T.U. As long as we determine allocations on a voting basis, which I question, there is just no other way to further your proposals.

I have reservations whether the United States should continue to support so strongly the I.T.U.

Continued on Page 129.

AMSAT NEWS

Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

Several months ago Dick Smith W1FTX made a suggestion that on the OSCAR 7 two-to-ten meter translator we attempt to set up a certain portion of the passband for CW and another portion for phone and other types of emission. In this way some of the QRM caused by the general incompatibility of different modes, which has been very prevalent on AMSAT-OSCAR 6, would be alleviated.

As everyone probably knows by now, in OSCAR 7 the downlink for the two-to-ten meter translator is 29.40 to 29.50 MHz, with the beacon at the high end on 29.50MHz. The corresponding uplink is 145.85 to 145.95 MHz. What is proposed is to encourage CW stations to use the sub-band 29.445 to 29.495 MHz (5kHz is reserved for a guardband for the beacon) except when wishing to contact a specific phone station operating below 29.445. Phone stations and all other modes, such as SSTV and RTTY, are asked to stay below 29.455 MHz. Thus, the 10 kHz band 29.445 to 29.455 MHz will be sort of an "everyman's land." The reason that the high end, rather than the low end, was selected for CW as is usually the case on the HF bands, is that the beacon is on the high end in OSCAR 7 and it is felt that CW stations will pose less of a QRM threat to the beacon. Also, many people on CW on OSCAR 6 are crystal controlled, whereas almost everyone on phone (SSB) is VFO. Using the high part of the OSCAR 7 passband for CW will mean that many crystals useful for OSCAR 6, can also be employed when working through OSCAR 7.

We think that this plan is worth trying and hope that all OSCAR 7 users will get behind it and make it work. Those not adhering to it should be GENTLY reminded.

Spacecraft Description

AMSTAT-OSCAR 7 is a small communications satellite designed to operate with small stations in the amateur service on a non-commercial basis. The spacecraft contains two basic experimental repeater packages, redundant command systems, two experimental telemetry systems, and a store-and-forward message storage unit. The spacecraft is solar powered, weighs 65 pounds, and has a three-year anticipated lifetime. It contains beacons on 29.50, 145.98, 435.10 and 2304.1 MHz.

Communications Repeaters

Two types of communications repeaters are aboard the spacecraft, only one of which operates at a time. The first repeater is a higher power, two-watt version of the one-watt two-to-ten meter linear repeater that flew on the OSCAR 6 mission. This unit receives uplink signals between 145.85 and 145.95 MHz, and retransmits them between 29.4 and 29.5 MHz on the downlink. A 200 milliwatt telemetry beacon provides telemetry data on 29.502 MHz. Approximately − 100 dBm is required at the repeater input terminals for an output of 1 watt. This corresponds to an eirp from the ground of 80 watts for a distance to the satellite of 2,000 miles and a polarization mismatch of 3 dB.

The second repeater, constructed by AMSAT Deutschland e.V., AMSAT's affiliate in Marbach, West Germany, is a 40-kHz bandwidth linear repeater. It employs an 8-watt PEP power amplifier using the envelope elimination and restoration technique to maintain linear operation over a wide dynamic range with high efficiency. This repeater has an uplink from 432.125 to 432.175 MHz, and a downlink from 145.925 to 145.975 MHz. Since the uplink band is shared with the radio location service, an experimental pulse suppression circuit is incorporated in the repeater to reduce the effects of wideband pulsed radar interference in the uplink. Developmental versions of this repeater have flown in high-altitude balloon experiments in Germany, and aircraft flight tests of the repeater prototype unit. A 200 milliwatt telemetry beacon on 145.975 provides telemetry data. Approximately 80 W. eirp is required to produce 3 watts of repeater output at a range of 2,000 miles assuming a polarization mismatch of 3 dB.

The two repeaters are operated alternately by means of a timer arrangement, but repeater selection and output power control can also be accomplished by ground command. Each of the repeaters includes a keyed telemetry beacon at the upper edge of the downlink passband to provide housekeeping data and to provide a frequency and amplitude reference marker to assist the amateur in antenna pointing, Doppler frequency compensation, and setting uplink power level. The cross-band (146-to-29.5 and 432-to-146 MHz) design of the two repeaters will permit the amateur to monitor his own downlink signal easily, and consequently, he can adjust his power and frequency to continually compensate for changing path loss, repeater loading and Doppler shift. It is anticipated that such a method of self-monitoring and control can eventually be made automatic through closed-loop frequency and power control circuitry that can be developed for the ground terminal equipment. Both repeaters are designed for use by as many as one to two dozen single-sideband amateur stations, all transmitting simultaneously, where downlink self-monitoring will minimize interference between users and will also permit duplex operation as well as self-control of power balance.

Oscar 6 Orbiting Information for December

Orbit	Date (Dec)	Time (GMT)	Longitude of Eq. Crossing °W
9722	1	0126.7	70.1
9734	2	0026.7	55.1

9747	3	0121.6	68.8
9759	4	0021.5	53.8
9772	5	0116.5	67.5
9784	6	0016.4	52.5
9797	7	0111.3	66.2
9809	8	0011.2	51.2
9822	9	0106.2	64.9
9834	10	0006.1	49.9
9847	11	0101.0	63.7
9859	12	0001.0	48.6
9872	13	0055.9	62.4
9885	14	0150.8	76.1
9897	15	0050.8	61.1
9910	16	0145.7	74.8
9922	17	0045.6	59.8
9935	18	0140.6	73.5
9947	19	0040.5	58.5
9960	20	0135.4	72.3
9972	21	0035.4	57.3
9985	22	0130.3	71.0
9997	23	0030.2	56.0
10010	24	0125.2	69.7
10022	25	0025.1	54.7
10035	26	0120.0	68.4
10047	27	0020.0	53.4
10060	28	0114.9	67.1
10072	29	0014,8	52.1
10085	30	0109.7	65.9
10097	31	0009.7	50.8

LETTERS

Continued from Page 13

the "Shades of 1931" that horrified ex-K3IEW. You know, Wayne, just because a technique has been known or available for many years is not an infallible indication of the utter worthlessness of the technique!

So it proved in this instance. The Hartley oscillator (built in 1929. . .not 1931) plus a simple lamp indicator performed what "state of the art" devices had failed to do: Indicate resonance on an antenna with high induced resistance.

As for the amazing techniques outlined as prime information by ex-K1IEW, are they in any manner different than those employed in common use by those who are aware of their sharp limitations? Not to mention by a much larger number of persons who are not aware of such limitations. It's the later group that comes up with some of the wild and totally baseless ideas about the performance of antennas and transmission lines.

In his bombastic effort to establish his omniscience, ex-K3IEW completely overlooked (or ignored) the one simple, basic principle: Keep it simple. An amateur who doesn't have access to a stack of laboratory equipment (or, in my case, even one who does) can make effective use of equipment on hand (or that can be built from any hellbox) to perform evaluative measurements.

Thank you, Wayne, for listening to my explanations.

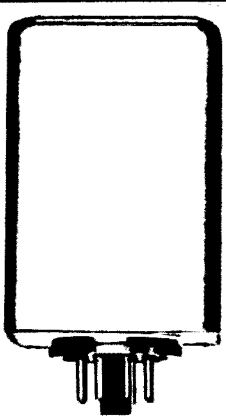
Carl C. Drumeller W5JJ

IRS AND FCC

Just wanted to add a bit of encouragement in your efforts with the FCC and the IRS. I feel that these two bodies have harassed rather than encouraged the public and in so doing have violated their primary assignments. Nuf said.

L. M. Brooke W9LSS

TOUCH—TONE DECODER



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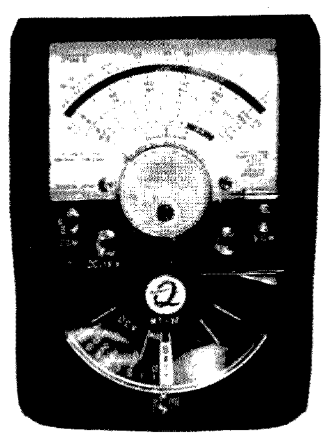

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GRR GRRREEN

Japan is passing us by. . .

The big ham magazine in Japan is called "CQ Ham Radio" and when we say big we're grossly understating the situation. Would you believe 500 pages a month? Right! Their average issue makes that November book sized issue of 73 look thin. How would you like to try and get through 500 pages a month?

Have you thought much about why most of the ham products you see these days come from Japan? Consider where we would be in low band gear without Yaesu, Collins, SBE Trio (Tempo) and Kenwood. And look at the VHF equipment from Drake, Swan, Standard, Icom, SBE, Audioland (Beltek), ITC (FDK), and Yaesu.

A substantial percentage of the ham gear sold in the U.S. is now designed and made in Japan – and there is a lot more to come. The fact is that they have a lot more gear available over there that we haven't even seen here yet – stuff that would make your mouth water – fantastic things like the Icom IC-30, an incredible 450 transceiver – all kinds of things.

The Japanese magazine is filled with articles on activities of clubs and groups – an almost infinite number of construction projects – it is obvious that things are really happening over there.

What has brought about this boom in activity – the explosion of equipment? You may have heard that there are now more amateurs in Japan than in the U.S. – over 300,000 – and almost all of them are active. All this has happened just in the last few years – just since the Japan Amateur Radio League (JARL) got clubs to set up classes to get youngsters interested in amateur radio and get them licensed with the new code-free ticket. These clubs have been turning out thousands upon thousands of enthusiastic amateurs. There is more activity on the VHF bands in Japan than in the U.S., even on two meters – and they all have to work simplex there so far. That's right, even without repeaters two meter FM has taken hold. They have many times our level of activity on six meters – and certainly rival us on 450 MHz. They're even outdoing us on slow scan television, and this has just very recently been permitted there.

Our present policies are obviously bankrupt. . .

As Walker pointed out recently in a talk, the number of amateurs in the U.S. has been dropping off at the average rate of about 350 per month. Contrast this with the growth in Japan and the reason is clear for the large percentage of Japanese equipment being sold in the U.S. The bigger market in Japan has made it possible for manufacturers there to develop and sell ham gear that U.S. manufacturers can't afford to build.

Can anything be done to reverse this before it gets worse? And obviously the situation, if unchanged, can only get worse for us as the Japanese ham population passes 500,000 while ours sinks to around 100,000 active amateurs. That should put the last few U.S. manufacturers out of business.

Outside of hurting our national pride, perhaps there is nothing wrong with our buying all of our equipment from Japan. But we do have a lot to lose in the long run, as a country, if we do nothing to reverse this trend. It is no news to you that one of the industries with the largest growth potential for the future is electronics. We will be seeing electronics used everywhere – for sophisticated communications beyond present day imagination – for replacing our outmoded mail system – banking – news – opinion – buying just about everything by remote control from a home terminal – traffic control – the list is endless.

How much of this electronics growth is going to be coming from Japan and how much from the U.S.? You've already seen them take over the transistor radio market, a good part of the television set market, much of the hi-fi market and a substantial part of the hand calculator market. With hundreds of thousands of youngsters going into the Japanese electronics industry in the next few years you can bet that they are going to be able to pin our economic ears back even more than they have so far.

Japan is already exporting more electronics than the U.S. The satellite earth station in Jordan was built by Nippon Electric, not RCA. And this is happening everywhere – and it is going to do nothing but get worse (from our standpoint) unless we counter in some way.

One practical move would be to admit that Japan is one up on us hamwise and take a page out of their book – set up our code-free license – get our clubs to set up licensing classes and do everything within their power to get youngsters into those classes. Demos and education about amateur radio in the schools, the shopping centers, on television and radio all will work for us. It is very difficult to do this without any direction on a national level – and so far the ARRL has been implacably opposed providing this direction – and totally dedicated to stopping anyone else who tries. New faces in the ARRL Directors' chairs won't hurt.

With or without the League every club in the country can get going on a program for bootstrapping amateur radio. The effort might just do a lot to pull some

faltering clubs together and give them a real sense of purpose. Until we do get a code-free license the 73 code tapes are an almost painless way of teaching the code. Hundreds of clubs are using them with spectacular success. The 73 guides are by far the simplest way of teaching the theory.

If your club decides to get going on this please be sure to let us know at 73. How about a picture of your study classes — even if it is a Polaroid (black and white, not color)? If you find any new way of getting the information across — write about it so we can pass the knowledge along. If you find a way of getting youngsters recruited into the classes, send us pictures and write about it. We'd love to fill a good deal of the magazine with ideas and enthusiasm for getting amateur radio off dead center in the U.S. Perhaps the day will come when we, too, will have a monthly 500 page magazine filled with pictures of clubs doing fun things, and hundreds of construction projects.

With a little work on all our parts we can look forward to amateur radio growing to over a million active hams — and think of what that can do for our electronics industry, not just as consumers, but as engineers, technicians and scientists.

Will we have room for all these multitudes on our bands? Lordy, yes! Right now the six meter band is virtually vacant — and that is four megaHertz of perfectly good ham channels. Half of two meters is just plain vacant — two more MHz. Need I remind you of the five MHz up on 220? And how about the 10m band? When have you heard 15m really full? Oh, parts of 20m may get a lot busier — but that could be just what is needed to get us off our duffs and into designing circuits to solve the problem — and there are lots of very good ideas that have been suggested that might die for the lack of development without just such an impetus.

What can we do about this. . .?

If there is any serious interest from clubs in getting going on a project to repopulate ham radio, we'll do everything we can here at 73 to help. Perhaps some buttons saying, "I'm a HAM — ask me about it" would be helpful? How about a poster for radio stores, high schools, and bulletin boards giving a very brief promo on ham radio — and then a place to put your club meeting place and time? Or even someone to call for further information?

We are at work on a very basic booklet describing ham radio which will be available for clubs to give out at public demonstrations or for TV stations to send out in response to a ham program.

Is there a TV station or a radio station without at least one ham? Unlikely. Perhaps we can get ham clubs to put on some programs on local stations telling about local ham activities — and educating the average man.

I realize that this idea will meet with a lot of resistance at your club. You may be surprised to find that there are some club members who are against just about anything constructive — but for heaven's sakes don't let these old foggies (of any age) slow you down.

Let's show Japan a growth rate for hams that will set them back on their obis.

And, in case of war. . .?

Of course there is no possible chance of there being another big war, so we really don't have to worry about having a healthy electronics industry for that. But if, by chance, one of our brinksmanships springs a leak, perhaps we can do our best to keep Japan on our side this time so we can buy our equipment from them.

Amateurs who were around during WWII will remember that not only were hams in extremely short supply, but so was ham gear. Most of us sold our ham receivers to the government — at list price, by the way.

And suppose that by some weird circumstance Japan turned up on the other side next time? Again. Just remember what Commissioner Robert E. Lee had to say in his talk reported on Page two and his quote from Göering. Will we be the ones to learn the hard way to pay attention to history? Göering said that one of the major factors which lost the war for Germany was the discouraging of amateur radio — which came to haunt them when we moved ahead of them so rapidly in the development of radar. Radar could have saved their subs — and could easily have had a profound effect on the outcome of the war.

Buy now and pay very little later. . .

With inflation continuing, not a few amateurs are holding their money, wondering just what to do about the situation. Perhaps this is a poor time to hold money.

Our new president has, as of this writing, shown no stomach to cope with inflation. I won't get into a philosophical or political hassle with you over what really should be done — and I'm sure a whole lot of 73 readers who work for the government would not like to read suggestions about firing half of the government — or putting the heat on Congress to stop spending money dammit. So, as far as can be seen right now, inflation will be continuing for quite some time to come, and may well get a lot worse.

This is the best time to make major purchases, things that will be costing a lot later — or which will be resellable for a lot more later. Not a few pieces of ham gear sell for more now than they cost new a few years ago, as you know. If you like to buy on time, you have it even better for you get your equipment and then pay for it later with shrunken dollarettes. About the *only* thing that is going down in value is *money*.

Look at what has been happening to ham gear prices. The Emergency Beacon Dream rig started out at about $1000 and is now up to $1500. This has happened to several other rigs and will be happening to a lot more — watch. The chap who ordered a $1000 EB-144 will be able to turn around and make a profit when he gets his rig — if he can bear to part with it.

This is an excellent time to buy your equipment — before your money shrinks any further.

Is the Morse Code dying? Or is it just wounded?

Probably no religious belief is more subject to emotional reaction than faith in the Morse Code.

A great many amateurs believe in The Code. It is sacrosanct with them and they truly believe about Code being able to get through when the chips are down – about CW rigs being simpler and less expensive than phone rigs – and about CW contacts being a better class of contact than a phone contact.

Another large group of amateurs figure all those arguments are hogwash and that if God had intended us to whistle at each other he would have built us that way.

There is much to be said on both sides, of course.

During the old AM days it was a fact that CW could get through when phone couldn't make it, either because of weak signals or QRM. Sideband changed that a lot and the margin between the two is much narrower today. A confirmed CW man may not yet be aware of the change to sideband and may still be using this old argument.

How about CW rigs being less expensive than phone rigs? Well, for years that was certainly the case. In the early 30's a phone rig was mighty expensive, so most of us used CW – about 90 percent as a matter of fact. Today, if you'll check the Heath catalog, you'll find that there are sideband rigs available for less than CW rigs! Fact. How much is a used Heath HW sideband transceiver these days? You can't get on the air with anything much cheaper than that. They're only $112.50 brand new.

It used to be that a knowledge of CW was of value to the military in case of war, but now they have automated and seem to have little interest in code any longer. Other than the ham bands, where do you hear much CW?

In Japan they did away with the code requirement and now they have more licensed amateurs than we do in the U.S. The number of amateurs here has been dropping gradually for over ten years and amateur radio appears to many as a dying hobby as a result.

On the credit side of the ledger is the fact that Morse Code is awfully easy to learn these days. Old timers who struggled with code records and W1AW would be astounded to find out how utterly simple it is now to learn the code using the modern teaching techniques. Even that lengendary hump at ten words per minute has just about been eliminated. Thousands of new amateurs have picked up the code in a matter of a few hours using the latest cassette system which 73 Magazine has made available. This starts with a one hour introductory tape, at the end of which many people have learned all the letters, numbers and punctuation needed to pass the Novice exam. Next they practice with a one hour code group cassette sent at six words per minute. This gives them the margin for error they need to copy code at 5 wpm under the stress of an exam – even under the eye of an FCC inspector. The 14 wpm cassette takes just a few hours more to master. As far as we know not one single person who has been able to copy these tapes has managed to fail the FCC code test.

One of the petitions hanging fire with the FCC has to do with permitting Techs to use CW in the Novice bands. While this won't teach code as fast as a cassette, it certainly will help to create more of an interest in CW for Techs, and that seems beneficial.

CW afficionados maintain that they have more fun using CW than phone, and there is no reason to doubt this. Many amateurs have long felt that interest in CW might grow if the FCC reduced its requirements to perhaps 5 wpm for all classes of license. If the use of CW were promoted as a skill and as enjoyable instead of a fearsome threat keeping hundreds of thousands of people from becoming amateurs, the CW bands might start to fill up again.

Emphasis on code certificates, contests at hamfests, and plenty of articles on the subject in the ham magazines could help take the bad feelings about code out of the collective amateur mind. Who knows, when pride of accomplishment and fun are the motivating forces behind code instead of fear of failure before the FCC, we might enter a whole new era in amateur radio.

The use of fear and the threat of punishment to drive people onward has failed utterly all through history. Better the carrot than the stick, to coin an aphorism, and CW zealots would do well to give this some serious thought before CW disappears completely. The use of CW has dwindled from about 90 percent of all ham operations to somewhat less than 10 percent, so obviously something has been done wrong. If changes in the system are not soon forthcoming we could well see the end of the Morse Code.

The FCC is in the process of updating their technical exams for all ham licenses to bring them into line with current amateur practice – reflecting amateur interest in RTTY, SSTV, ATV, satellite work, FM, repeaters, synthesizers, solid state, digital techniques, etc. This means that perhaps for the first time the amateur technical exams will have more of an effect on the passing or failing of the license test than the code part of the exam.

Looking at the FCC official figures for the last three reported months for the FCC given Tech exams we find that of 275 tests given less than 6 percent managed to flunk the written part of the test – and most amateurs would agree that the Tech written test is a whole lot harder than copying code at five words per minute. Yet less than 65 percent of those who tried for the Tech license made it! The code toppled one third of those who took the exam.

The Extra Class applicants did a bit better, with 75 percent of them passing the code test and 84 percent passing the written. The code is still, by far, the determining factor and not technical knowledge. Is this what we really want? Is this situation in the best interests of amateur radio and the

growth of our hobby?

What do *you* think about the code? Should we continue to require the ability to copy at 13 per for the General and 20 per for the Extra? The 5 words per minute we require for the Novice and Tech licenses meets the requirements of the ITU, so there is no international agreement that we have to worry about. Should we plan to depend in the future on a technical exam as the entry requirement into the hobby instead of a skill — the code?

CB is not what a lot of amateurs think it is. . .

More and more amateurs, attracted to CB by the traffic information service on channel 10 (channel 19, west of the Mississippi), are finding that when the skip is not coming in the band is seldom crowded and is able to provide quite enjoyable contacts.

Many readers of 73, who ask not to be named (for obvious reasons), say that they have found that modest amplifiers are absolutely necessary for any kind of reliable communications — with a level of about 25 watts input being normal.

Even in New York and other large cities there are seldom times when several are not usable without interference. Sure, there are some nuts playing records on one or two channels — the CB counterpart to the mystery ka-chunkers on repeaters — but for the most part the contacts are not all that different from those on some of the ham bands.

The amateur who spends much time in his car is the one who can definitely benefit from CB. It is nice to be warned a few minutes before you come to a traffic tieup on an expressway so you can route around it. It's nice, some drivers feel, to have a good idea of where the police may have set up a speed trap — particularly in the day when the legal speed is 55 and the traffic is moving at 65 to 70. At least we don't have to worry about weighing stations the way truckers do. They find CB a blessing when it helps them avoid a fine for being overloaded.

73 would like to hear from amateurs who are using CB — and get more input for the readers on how things are in your area.

Let's make "Ham" a term to be proud of. . .

More and more CB articles in newspapers and on television news reports are calling CBers hams. Either we get busy and fight back vigorously or we give up and let CBers get that label by default.

There are some vocal amateurs who don't like the name "ham." It is not dignified. One dedicated anti-ham ham has virtually made a career out of grumbling about this — in his club bulletin — in letters to Ham Radio magazine — etc. But perhaps there are some reasons to hold on to that appellation. Perhaps we would be throwing away a good PR lever if we were to abandon that term which has stuck with us from the antiquity of spark days.

The term "ham" has a lot more grab to it than "amateur radio." Fact. This means that if we use it properly we can get a lot of mileage out of it as a way of getting interest and attention. "Hams" is a lot easier to say, print and even think about than "amateur radio operators." The term is well enough known today so even "radio hams" is redundant. You need a little something like this to get people's attention.

Where, oh where, is Dean Burch these days?. . .

One of the questions that invariably comes up at hamfest and club talks is the CB proposal to grab a lump of our 220 MHz band.

As far as I can see, this is still up in the air, waiting on political matters. Insiders at the FCC report that virtually no one there is in favor of making any new CB bands — and certainly not out of a ham band — but they realize that the decision will probably be a political one over which they will have little say.

Lacking any concrete data on this, I'd like to speculate.

From what I've been able to find out, the main pressure for the proposal came from Dean Burch, erstwhile FCC Chairman. I have no idea what argument the EIA used to win Mr. Burch over so unshakably, even in the face of stiff resistance from the people in the FCC. But, someway, it appears that the EIA has won unswerving loyalty to the idea.

When Burch went from the FCC to the White House to work with Nixon he apparently did not lose his power noticeably as far as his influence on the 220 CB proposal was concerned.

When Nixon moved to San Clemente we stopped hearing about Burch — but now it seems highly likely that he is still with Nixon and working from California. A recent report said that virtually the entire Whie House staff went with Nixon and is working out there, paid for out of Ford's White House maintenance fund.

In view of the expose of the deal between Nixon and Ford reported in New York Magazine which resulted in Nixon stepping down and then getting pardoned in advance for anything and everything and which apparently even includes a pardon for Haldeman — unless the article scotches that — it appears that Nixon will be doing a good deal of the running of the government, using his same old staff. If this does work out as reported it is very possible that Burch will be able to keep up the pressure on behalf of the EIA and for the 220 CB plan to go through.

The idea of Nixon still being in the president business as a semi-silent partner to Ford and making deals on behalf of foreign countries is unsettling and it is possible that Congress may be able to do something about it now that the deal has been exposed. Apparently one of the last things that Ford wants is to have Nixon start releasing any of the hundreds of tapes made of his conversations with Nixon — tapes of at least 85 separate occasions when he met with Nixon at the White House and was unaware that he was being taped — and tapes of over a hundred candid phone conversations, also made without his knowledge. It is

hinted rather strongly that the fear of these tapes being disclosed brought on the deal which included the pardon and the resultant power that Nixon still seems to hold.

Haldeman figures in this as the one man who also knows what is on most of the tapes and probably the only one with a good index to them. This is why Ford is expected to pardon Haldeman.

Well, we'll see — and hope that amateur radio doesn't get chopped up as a result of these sordid political messes.

Hotline vs Ham Radio Report

One of the fun things about writing the bi-weekly Hotline is watching the "competition" and seeing what scoops they get — what they miss — and making sure that Hotline is a lot better.

Some of the news is difficult to get and every now and then we get beaten to a story, but not often. There is a good deal of satisfaction to opening up the competition and going through with a blue pencil and marking all of the stories that appeared in the previous issue of Hotline. . .and this often covers a substantial part of the HR Report.

The Ham Radio answer to the 73 Magazine newspages — the Presstop page (amazingly similar to QST's League Lines) — condenses the meat of the HR Report.

Of course Hotline has a great advantage over HR Report in that there is vastly more space available for news. The average issue of Hotline runs two to three times the number of words of HRR. There is much to be said about having everything under one roof as far as efficiency and cutting costs are concerned. Report is written by an amateur in Chicago, set in type on an ordinary typewriter, sent to another town to be printed — and back again to be mailed. Hotline is written right at 73 Magazine — the type is set by 73 — the artwork is prepared there — the photographs — negatives are shot in the 73 photo lab — printing plates made — Hotline is printed in two colors — folded, addressed and mailed — all at 73. Report has to use one color and can't have photos and has to come out as a typewritten page while the Hotline comes out as a small newspaper, complete with illustrations, photos, and any length the news determines — four, six or even eight pages when there is a long FCC docket or two to be published in detail.

The efficiency of the operation has made it possible to not only put out a more up todate newsletter, but to do it at substantially lower cost. Report costs $12 per year, Hotline is only $8.

Open Letter to CQ's Publisher

Your publisher's message in the October issue of CQ — your thinnest issue since August 1955 indicates that you are having serious problems. In the event that CQ should cease publication some provision should be made to keep the amateurs who have invested their hard earned money in subscriptions from losing out completely.

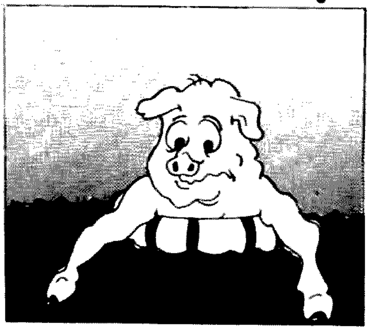
Also, it would be a shame to have some of the contests which CQ has run for many years disappear — for instance the World Wide DX Contest.

I would like to state that 73 Magazine stands ready to take on the fulfillment of circulation (except for free or duplicate subs and things like that), and the continuation of some of the CQ sponsored contests.

CQ has many times in the past performed valuable services for amateur radio and I am sure that many amateurs will join me in expressing genuine regret should it be necessary to cease publication. My collection of the vintage years of CQ stands proudly on my bookshelf.

Wayne Green — Publisher 73

Ham Help



This column is for those needing help in obtaining their amateur radio license.

If you need help, let 73 know — don't be bashful — the readers are solid gold and are anxious to help you. If you would like to help, let 73 know about that plus your area of expertise, if any, so we can list you for either general help or as a technical advisor.

The following need some help — can *you* spare some time? Clubs in particular take note.

Ted Rappaport
517 East Main Street
Cambridge City IN 47327
Ph. 476-2923

Larry G. Griffis
SP/5 E-5
Department of The Army
Hdqts, U.S. Support Activity Iran
APO New York 09205

Robert M. Gallery
4058 Batterylane
Apt. 114
Bethesda MD 20014
Ph. 301-652-5332

Lennie Fekula
Rd 1
Hickery PA 15340
Ph. 412-356-7316

Ernest F. Rubino WA6RPP
1925 Otay Lakes Rd Sp #88
Chula Vista CA 92010

Jerome F. Coplan
4433 Troo St.
Kansas City MO 64110

The RAM asse. ARC
c/o Monte Tremont
3 East Princeton Avenue
Pleasantville NJ 08232
Ph. 609-646-2200

Caveat Emptor?

PRICE – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order. Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.
Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.
We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.
For $1 extra we can maintain a reply box for you.
We cannot check into each advertiser, so Caveat Emptor . . .

SELL: ROBOT SSTV Models 80 Camera and 70 Monitor. Original cartons and instruction books. Excellent condition. $500.00. Gordon Buckner WØVZK, Box 721, Marshall MO 65340.

JIG SAW PUZZLES wanted. If you have any old wooden jig saw puzzles in your attic – or run across them at an auction (they go for 25¢ usually), please keep in mind that Wayne Green collects them and might even pay a buck a peice for them. c/o 73 Magazine, Peterborough NH 03458. Wood, not cardboard and complete.

CALL LETTER LICENSE PLATES – still being collected by 73 Magazine for possible cover use. Please send in an old call letter plate – most treasured are out-of-district plates such as W2NSD/NH, etc. Got any real oldies? 73 Magazine, Peterborough NH 03458.

TV-3B/U NAVY portable tube tester, good working condition. $25. WA1TEJ, 100 Granite Street, Londonderry NH 03053.

AN/FRR-23 (AN/SRR-13) general coverage modular receiver with book, excellent condition. $100. WA1TEJ, 100 Granite Street, Londonderry NH 03053.

RCA SENIOR VOLTOHMYST – professional grade VTVM, new, never used. $50. WA1TEJ, 100 Granite Street, Londonderry NH 03053.

INSTRUCTION MANUALS thousands available for test equipment, military electronics. Send $1.00 (refundable first order) for listing. Service of Tucker Electronics, Box 1050, Garland TX 75040.

TWO PLASTIC HOLDERS frame and display 40 QSL's for $1.00, or 7 holders enhance 140 cards for $3.00 – from your dealer, or prepaid direct: TEPABCO, Box 198M, Gallatin TN 37066.

YOUR SWAP-N-SELL ads run free in TRADIO, a public service publication of Wichita Amateur Radio Society, Box 4391 Wichita Falls TX 76308.

FROM UNIVERSITY-Sound 4 C 15 W Woffers in unopened cartons. Retail $169 each. Will sell at $100.00 ea. Write Cassette Headquarters, P.O. Box 431, Jaffrey, N.H.

CLEANING OUT: parts, antennas, equipment, accessories, magazines. Bargains. No junk. Write SASE, Dave Schearer, K3SWL, 826 North Fifth, Reading PA 19601.

NEARSIGHTED? Improve your sight, whether nearsighted or farsighted, with tested exercises, sound theory. Hardbound. Ham discount $7.00 ppd. M. Windolph, 3140 Meramec, St. Louis MO 63118.

PERSONAL ATTENTION plus the best cash deal anywhere is what you receive at QUEEN CITY ELECTRONICS in the heart of the Midwest. Queen City carries all major brands including Drake, Tempo, Kenwood, Yaesu, Swan, Regency, Clegg, Standard, Icom, Genave. . .write or phone us for your equipment needs. Queen City Electronics, Inc., 7404 Hamilton Avenue, Cincinnati, Ohio 45231. (513) 931-1577.

FOR SALE: Like new Swan 500 CX with ac TR-4 with ac and Regency HR-2S. Make offer – must sell. WB4SUY 615 728-4613, P.O. Box 402, Manchester TN 37355. Ron Reeves.

AMSAT/OSCAR 6-7 SLIDES set of 5, $1.25 lift-off and equipment proceeds AMSAT. K6PGX, P.O. Box 463, Pasadena CA 91102.

FREE: 12 Extra crystals of your choice with the purchase of a new Regency HR-2B at $229. Send cashier's check or money order for same-day shipment. For equally good deals on Collins, Drake, Yaesu, Kenwood, Swan, Atlas, Standard, Clegg, Icom, Hallicrafters, Tempo, Ten-Tec, Venus, Alpha, Hy-Gain, Cush-Craft, Mosley and Hustler, write to Hoosier Electronics, your ham headquarters in the heart of the Midwest. Become one of our many happy and satisfied customers. Write or call today for our low quote and try our individual, personal service. Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. (812) 894-2397.

2 METER FM. MOBILE "CARTOP" ANTENNAS – 1/4 Wave and 1/2 Wave models. Unique, secure, instant mount. No magnets; no drilling holes. Omnidirectional – unlike trunk lid mounts. Tuneable 1:1 SWR. Money-back guarantee. 1/4 Wave Model $16.95*; 1/2 Wave $18.50*. *Add $1.00 shipping and handling. (Conn. residents – Sales tax). MARSH DEVICES, P.O. Box 154, Old Greenwich CT 06870. Literature available.

FROM UNIVERSITY-Sound 4 C 15 W Woffers in unopened cartons. Retail $169 each. Will sell at $1.00 each. Write Cassette Headquarters, P.O. Box 431, Jaffrey, N.H.

FOR SALE – Drake L-4B linear amplifier. Still in packing cartons. Asking $610.00. Joseph J. Schoffhauser, 78 Geer Avenue, Norwich CT 06360.

EQUIPMENT FOR SALE: DX-60 with HG-10 VFO, $50; HX-20 with AC-supply, $50; SX-111, $50; ARC-5 rcvr, 80m, with AC-supply, $15; ARC-5 xmtr, 40M, $10; Redline keyer, similar to TO-5, $20; SR-160 with AC & mobile supplies, $150. Larry Osolkowski, WB2HFU, 87 Park Avenue, Hamburg NY 14075.

WANTED: Hallicrafters SX-88 for parts, any condition considered. KØMNA, 4805 Sullivan, Wichita KS 67204.

FOR SALE: SB-301 3 filters, all 10 mtr crystals, SB-600 speaker, cal. and 6 and 2 meter converters with manual $250.00. Call Jim W1VYB (617) 922-3850.

ANTIQUE RADIO BUFFS. Do you need a schematic for your radio? For information send SASE showing make and model number. Joseph C. Crockett K3KUL, 762 S. Gulph Road, King of Prussia PA 19406.

1101A RAM: $2.25; 1103 RAM: $3.00 2513, 2516: Char. Gen: $12.75 ELECTRONIC DISCOUNT SALES, 138 N. 81st Street, Mesa AZ 85207.

NOW PAYING $2000.00 and up for ARC-94/618T ARC-102/618T. $1200.00 and up for ARC-51BX. $1500 and up for 490T-1 antenna couplers. We also need these control boxes — C-6287/ARC-51BX C-6476/ARC-51BX C-714E-2. We also need R-1051 receivers RT-662/Grc-106 transceivers. We buy all late aircraft and ground radio equipment. Also pack radios. We are buyers not talkers. Bring your equipment in, you are paid on the spot. Ship it in, you are paid within 24 hours. We pay all shipping charges. If you want the best price for your equipment, call us. Call collect if you have and want to sell or trade. We also sell. What do you need? D&R Electronics, R.D. 1 Box 56, Milton PA 17847. Phone (717) 742-4604. 9:00 AM–9:00 PM.

TECH MANUALS for govt. surplus gear — $6.50 each: R-390/URR, R-220/URR, URM-25D, CV-591A/URR, CV-278/GR, TRM-1, TS-382D/U, TS-497B/URR, TT-63A/FGC, URM-32. W3IHD, 7218 Roanne Drive, Washington DC 20021.

MERRY XMAS and Happy New Year from WØCVU. First amateur in the world awarded the RSGB EMPIRE AWARD on two way SSB in 1962. Chas. W. Boegel, Jr., 1500 Center Point Rd. NE, Cedar Rapids IA 52402.

HOW INTELLIGENT ARE YOU? Test reveals IQ in hour. Self-scoring, very accurate! Money back guarantee! Send $2.00 Chuck WA6NPP, Box 186-C, Monterey Park CA 91754.

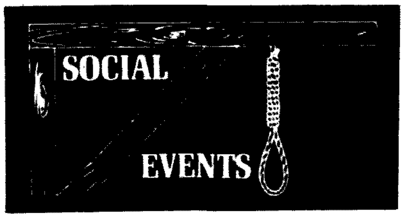
MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding, literature Estes Engineering, 543-A West 184 Street, Gardena CA 90248.

EQUIPMENT CLOSEOUT

The following equipment has been purchased by 73 Magazine for test or has been received in lieu of payment for ads. Most gear is either brand new in the original cartons or else like new after a few days of testing in the 73 labs.

MITS 908M Calculator w/p.s./case (4143) new	$ 79
Heath IC-2009 calculator—brand new ($92)	$ 79
Signal One CX7-A—tested—perfect—like new—fantastic	$1989
Concord video monitor VM-12—tested ($400)	$ 199
Regency 450 MHz scanner — ($200) like new	$ 139
Varitronics PA-50 2m amp ($110) brand new 10w in 50 Wout	$ 89
RP tone burst gen—5 freq—TB-5 exe ($37.50)	$ 25
Regency HR-6 ($240) six meter 10w xcvr 12ch	$ 189
Regency ACT-R8H/L Scr ($160) VHF/UHF Sch scr receiver	$ 129
Standard SR-C826M (4398) 10w 12ch 2m xcvr used	$ 265
Regency HR-2MS ($319) 2m 15w xcvr with 8ch scanner	$ 259
SBE SB-450TRC ($180) 450 MHz transverter	$ 139
Regency Pocket scanner 4 channel ACT-P4H ($120)	$ 89
Cobra 220 MHz Transceiver 10w 12ch ($300)	$ 255
Standard 14U 2m 22ch superfantastic VOX ($510) demo	$ 429
Pacificom 2m HT—brand new—($250)	$ 169

All Prices fob: UPS collect.
73 Magazine — Peterborough NH 03458



HOT SPRINGS, ARK. DEC. 7

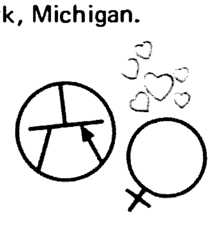
The Annual Banquet of the Arkansas DX Association will be held on Saturday, December 7, 1974, in Hot Springs, Arkansas. The featured speakers will be Jim Rafferty WA9UCE/6 who will give a slide, movie and tape presentation of the KP6KR Kingman Reef DXpedition; and San Hutson K5QHS who will give a slide presentation of his recent Martinique, Guadeloupe and Dominica DXpedition. Registration and reservations will be handled by W5QKR, RFD 2, Box 254, Hot Springs, Arkansas 71901 and further details may be obtained from him.

PASSAIC NJ DEC 23 – JAN 1

The Knight Raiders VHF Club K2DEL will sponsor a VHF Activity Week December 23, 1974 thru January 1, 1975. Contacts may be made on any band above 50 MHz. Participants who work the club station and 5 club members will receive a Knight Raiders Award certificate. Those who work at least 10 of the 16 municipalities in Passaic County will receive a Passaic County Award certificate. Stations within Passaic County are eligible for both awards. A one dollar fee must be sent for each certificate for the cost of handling and postage. Send fee(s) and logs to: Knight Raiders VHF Club, P.O. Box 1054, Passaic, New Jersey 07055.

OAK PARK, MICH JAN. 12

Oak Park Amateur Radio Club's sixth annual swap and shop at the Frost Junior High School Cafetorium, 23261 Scotia, Oak Park, Michigan.



LEE ADDRESS

Continued from page 118

as it is now constituted. There are 148 member countries of the Union, around 90 of which regularly attend conferences. Each nation has an equal vote. Many of them are years away from having the kind of sophisticated communications as ourselves, yet frequencies are reserved for the day when they might have them. Conversely, countries with great demands for frequencies for Amateurs, such as ourselves and a few others throughout the world, find minimal support if any at all from countries which have never fostered Amateur Radio and have little interest in voting additional allocations.

A concrete example of this kind of situation occurred during the recent Maritime Conference when a United States' position on coastal maritime stations was supported by only six other votes. Unless there are other diplomatic considerations of overriding importance, I would favor the United States exploring the possibility of negotiating more desired resolutions to our problems with other nations having common interests in a roughly parallel state of development, rather than attempt to deal with the entire membership of the I.T.U.

However, we proceed and whatever the results, Amateurs of the future will look back with some judgement as to what was done on their behalf. The QCWA can be an influential force in this planning stage for the future of Amateur Radio. Recognizing the present transitional phases of communications, there was never a better opportunity to improve your allocation status, especially in the high frequency portion of the spectrum. I don't mean it will be easy nor pre-ordained. But if it is to ever happen, the 1979 Conference is the arena for the decision.

Your Amateur Satellite program is well on its way. OSCAR 7 is due to be launched any day now, if it hasn't already happened. I envisage the day when Amateurs will have a global satellite system utilizing near geostationary orbits for their satellites. The areas of innovation have probably passed from the terrestrial sphere to the spacial arena, but that should be no insurmountable barrier to Amateurs' contributions to future technical developments. Circumstances may well inhibit individual inventions in such a complicated field. But in a professional capacity with the background of Amateur Radio, innovation can be enhanced and I believe that Amateurs will continue to make a large contribution in the technical field.

By now you should know that I believe in Amateur Radio. I believe it is a valuable aspect of our life. And I shall do everything in my power to assist in its continued well-being, looking toward its further contributions to our national telecommunication requirements. I wish you all the best of success.

HAMS AID HONDURAS

Continued from page 3.

supplies relayed by Honduras-based amateurs.

Most of the United States' amateurs were members of the American Radio Emergency Corps and other service organizations that operate long-established emergency communication networks and train regularly in preparation for emergencies such as that in Honduras.

Much of the emergency amateur radio activity was centered in the Miami area. The week after Fifi struck, a team of bilingual amateurs from Miami's Sociedad Internationale de Radio Aficionados flew to Honduras to assist operations there.

Eighty-five percent of the communication in Honduras is now handled by amateur radio, and the activity is expected to continue until normal communications are fully restored.

Among amateurs involved in the relief operations were Omar Parades, HR1OP, and Jonathan R. Toeldo, HR1RT, Tegucigalpa, Honduras; Frank V. Savat, WA5YOI, Shreveport, La.; John W. Christy, WØUKD, Minneapolis, Minn.; Charles A. Giannetta, WA3RSQ, Bethlehem, Pa.; Rafael Estevez, WA4ZZG, Hialeah, Fla.; J. H. Goodwind, VE3DPQ, a Canadian living in Miami; and Jose A. Pignatta, LU2BZ, Parana, Argentina.

50 MHz BAND

Continued from page 9.

Herb Brier, long time amateur radio columnist for assorted magazines has been on the shelves for some time now. After careful consideration I would have to say that it doesn't come off too well. Much of the material is a rehash of early ARRL VHF Handbooks which are a much better buy at \$2.50 than this book is at \$5.95. Early VHF history is covered a la W1HDQ but not as well. A repeater primer is included for anyone interested in the very basics. About the only mention of six meter equipment is a cumbersome converter and an enormous 500 W amplifier for 50–450 complete with plug-in coils. The construction illustrated is for the most part (and for the lack of a better word) "amateurish". No PC layouts are provided for items as complicated as a 2 M FM transceiver. Anyone who has ever tried to build VHF solid state equipment knows that the diagram is just the starting point. Getting it to work requires a great deal more effort and a fixed layout helps greatly to tie down the variables. Another feature is a 50 W tube type 2 M CW rig. The book is not up to the standards we have come to expect from the authors. In my opinion you would be better off to invest in an ARRL or RSGB VHF Handbook or a year's subscription to VHF Communications.

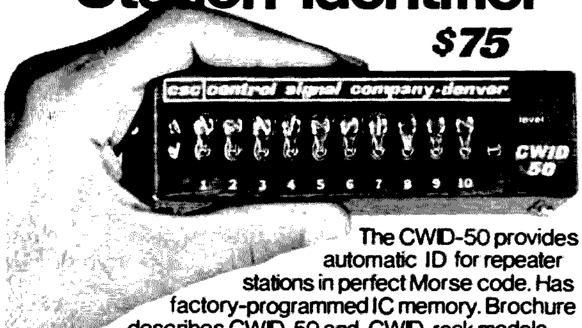
. . . WAØABI

Support Ham Radio — Have A Ham For Dinner

1974 Article Index

Station Identifier

$75



The CWD-50 provides automatic ID for repeater stations in perfect Morse code. Has factory-programmed IC memory. Brochure describes CWD-50 and CWD rack models.

control signal co 5964 W. COLUMBIA PLACE DENVER, COLORADO 80227

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DECEMBER 1974

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PROPAGATION CHART

J.H. Nelson

Good (open) Fair (□) Poor (O)

December – 1974

Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
1	$\boxed{2}$	$\boxed{3}$	$\boxed{4}$	$\boxed{5}$	6	7
8	9	$\boxed{10}$	$\boxed{11}$	$\boxed{12}$	$\boxed{13}$	14
15	$\boxed{16}$	$\boxed{17}$	18	$\boxed{19}$	20	21
22	$\boxed{23}$	24	25	$\boxed{26}$	27	28
29	30	$\boxed{31}$				

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7A	7	7	3	3	3	3	3	7	14	14A	14
ARGENTINA	7A	7	7	7	7	7	14	14A	14A	21	21	14
AUSTRALIA	14	7B	7B	3B	7	7	7B	7A	14	14	14	14
CANAL ZONE	7A	7	7	7	7	7	7A	14A	21	21	21	14
ENGLAND	7	7	7	3	7	7B	7A	14A	14A	14	7B	7
HAWAII	14	7B	7	7	7	7	3A	3	7B	14A	21	14A
INDIA	7	7	7B	7B	7B	7B	7B	14B	7B	7B	7B	7
JAPAN	14B	7B	7B	7B	7	7	3	7	7B	7B	7B	14B
MEXICO	7A	7	7	7	7	7	7	14	14A	21	14A	14
PHILIPPINES	7A	7B	7B	7B	7B	3A	3A	7	7	7B	3B	7
PUERTO RICO	7	7	3A	3A	3A	3A	7A	14	14	14	14	14
SOUTH AFRICA	7B	7	7	7	7B	7B	14	14A	21	21	14	14
U. S. S. R.	7	7	3	3	7	7B	7B	14	14	7B	7B	7B
WEST COAST	14	7	7	3A	7	7	7	7A	14	14A	14A	14

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	3	3	3	3	3	7	14	14	14A
ARGENTINA	14	7	7	7	7	7	7B	14A	14A	21	21	14
AUSTRALIA	14	7A	7B	7B	7	7	3B	7	14	14	14	14
CANAL ZONE	14	7	7	7	7	7	7	14A	21	21	21	14A
ENGLAND	7	7	7	3	7	7	7B	14	14	14B	7B	7B
HAWAII	14	7A	7	7	7	7	3A	3	7B	14A	21	21
INDIA	7	7	7B	3B	7B	7B	3B	7	7	7B	7B	7B
JAPAN	14	7B	7B	3B	3	3	3	3	7	7B	7B	14
MEXICO	7A	7	7	3	3	3	3	7	14	14	14	14
PHILIPPINES	14	7B	7B	3B	3B	3	3	3	7	7B	7B	7A
PUERTO RICO	7	7	7	7	7	7	7	14	14A	14A	14	14
SOUTH AFRICA	14	7	7	7	7B	7B	7B	14	14A	21	14A	14
U. S. S. R.	7	7	3	3	7	7	7B	14	7B	7B	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7A	7	3	3	3	3	3	7	14	14	14A
ARGENTINA	14	7A	7	7	7	7	7B	14	14	14	21	21
AUSTRALIA	21	14	14	7B	7	7	7B	7B	7A	14	14	14
CANAL ZONE	14	7	7	7	7	7	7	14	21	21	21	14A
ENGLAND	7B	7	7	3	7	7	3B	7B	14	14B	7B	7B
HAWAII	14A	14	7	7	7	7	7	3	7	14A	21	21
INDIA	7B	14B	7B	3B	3B	7B	3B	7	7	7	7B	7B
JAPAN	21	14	7B	3A	3	3	3	3	7	7	7B	14
MEXICO	14	7	7	3A	7	7	3A	7	14	21	21	14
PHILIPPINES	14A	14	7B	7B	3B	3B	3	3	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7	14	14	14A	14A	14
SOUTH AFRICA	14	7	7	3A	7B	7B	7B	7A	14	14A	14	14
U. S. S. R.	7B	7	3	3	3	7	3B	3	7	7B	7B	7B
EAST COAST	14	7	7	3A	7	7	7	7A	14	14A	14A	14

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

A = Next higher frequency may be useful also.
B = Difficult circuit this period.